SYSTEMIC BARRIERS TO A FUTURE TRANSFORMATION OF THE BUILDING INDUSTRY

FROM A BUYER CONTROLLED TO A SELLER DRIVEN INDUSTRY

An analysis of key systemic variables in the building industry, such as 'procurement model', 'buyer perception', 'production mode', and 'leadership and management', principally in a Danish development context and seen from the perspective of the architect.

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PhD **2011**

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ABSTRACT

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Degree of **Doctor of Philosophy**

SYSTEMIC BARRIERS TO A FUTURE TRANSFORMATION OF THE BUILDING INDUSTRY FROM A BUYER CONTROLLED TO A SELLER DRIVEN INDUSTRY

It has always been a 'mystery', why the Danish building industry stagnated after the industrial breakthrough, and never was able to adapt the industrial production, business culture, buyer perception, and leadership and management, used in nearly all other Danish industries.

This study offers *a new approach to understanding the problem* - by analysing *systemic barriers to the industry's transformation to a seller driven industry*, in the context of a widespread neglect of the need for industrialisation (a problem addressed by relatively little literature) with the building remaining a manual, craft based industry, based on the old building process and its associated business model. Industrialisation has instead taken place in the building *materials* industry, which in a Danish context is a separate and highly industrialised industry.

To analyse the barriers for transformation in the building industry a multidimensional approach is applied:

First the *building industry and modern industries are compared*. Two archetype models are created using the above mentioned variables; one model for the building industry and its "Buyer Controlled Procurement Model" and one for modern industries and their "Seller Driven Marketing Model" with interrelated production and sale, enabling them to sell to unknown customers.

Next the statistical *productivity trends* and other secondary data are examined to analyse, if the Seller Driven Marketing Model is performing better.

Finally *a Delphi Panel Consultation* is conducted to discuss future development scenarios. Michel Foucault's principles of historical analysis and his 'episteme' concept are used to analyse the outcome of the Delphi Panel Consultation.

This thesis contributes to knowledge by establishing that there is *interdependence* between the variables: Procurement Model, Buyer Perception, Mode of Production, and Leadership and management in a particular industry. These variables of respectively the craft era Buyer Controlled Procurement Model and the industrial Seller Driven Marketing Model are not interchangeable, implying that systemic barriers do exist. A transformational process to the Seller Driven Marketing Model, that replaces the existing production mode, its attached leadership and management, and buyer perception is required, if productivity is to increase, and result in price reductions for the customers.

Keywords: Systemic barriers, Building industry, Productivity trends, Buyer Controlled Procurement Model, Seller Driven Marketing Model, Procurement Model, Buyer Perception, Production mode, Leadership and management, Transformational leadership.

Declaration

The candidate has not, while registered for the present PhD submission been registered for any other award at a university. None of the material in this thesis has been used in any other submission for an academic award. Acknowledgements for received assistance are given under the heading "acknowledgements" below, and any excerpts from other sources have been acknowledged by its source and author.

Erik Kærgaard Kristensen
September 2011

Supervision

Principal Supervisor: Doctor David Moore

Supervisors: Professor Richard Laing and Doctor Bassam Bjeirmi

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Also, I would like to thank my wife Anne-Mette Kristensen, my children Tine, Jesper and Martin for positive support and for accepting my being abroad and being occupied with this research project.

Erik Kærgaard Kristensen
September 2011

Author’s note on translated quotations

In the case of referenced sources that are available in Danish only, I have – for the sake of English-speaking readers - chosen to include and translate such quotations that are important for the reader's understanding of the context, and indicated in brackets as Author's translation or translated by the Author.

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Part I. PROLOGUE

1. Introduction

In 1924 the famous architect Ludwig Mies van der Rohe (1886-1969) advocated that industrialisation is about fundamentally remoulding the whole building trade and NOT about rationalizing existing working methods (Rohe 1970 pp. 81-82). In his opinion this meant the total destruction of the building trade in the form in which it had existed hitherto… because the house of the future could no longer be constructed by building craftsmen… even though few of those concerned were really convinced of this need of industrialisation.

Mies van der Rohe's statements are as valid today - as in 1924 and it is noteworthy that so little has happened the last century in regard to the industrial transformation of the Building Industry. This emphasizes the importance of investigating what the barriers for transformation, really are.

1.1 Background to the thesis

Originally, this study was intended to focus on the leadership and management discipline in the building industry and how the industry could be transformed in order to increase productivity and reduce construction costs - to the benefit of public institutions, business enterprises, clients and citizens, who use and pay the buildings.
The lack of development in the building industry in comparison with most other industries, as illustrated in appendix A, has become more and more evident over the last many decades.

But as the study started, it became increasingly evident that there was far from agreement about, what prevented the building industry from developing along the same lines as other major industries into an industrialised sector.

The different opinions range from the perception that there is no need for development, and especially not influenced from outside (Kreiner and Våland, 2010)[1] to the opinion that the building industry is only sparsely industrialised and therefore the need for development and up-to-date leadership is huge. Examples of the latter are:

- 'Projekt Hus' (Boligministeriet 2000), a major government report which represents the turn towards industrialisation
- A Danish business magazine that on the occasion of an anniversary for the Organization of Architect firms, publishes a report on the future prospects of architect firms. The magazine report from Mandag-Morgen (2010) recommends increased specialization among architect firms.

As a reaction against this report, Kreiner and Våland (2010) questions its recommendations and protests against regarding architect firms as being 'standard businesses' fit for standard solutions.

All too many have commented on what direction the building industry and architects should follow, without having a consistent, thoroughly analyzed insight of what the problem in the industry really is. There is thus a need to clarify what *the development problem* is - even if it can be predicted, in the light of the above mentioned arguments, that there will be no agreement on such a problem description in the building industry.

However, the lack of development of the building industry is not entirely Danish but rather an international problem. Denmark is closely integrated in the global economy and the Danish building industry uses much the same materials, processes and technology as is found in other neighbouring countries. This lack of development in the building industry will in my study be illustrated in a Danish context, well knowing that specific Danish development trends and solutions might deviate from those found in other countries, while the overall international picture of the industry falling behind remains the same, see section 10.7.

Likewise, the debate and approach to understanding the building industry's problems will vary depending on tradition, political views, and economic

[1] Netværket Ledelse I Byggeriet. An open network, with base at the Copenhagen Business School, dealing with Leadership and Management in the Building Industry.

interests, and on which perspective is applied. Some observers find themselves in the 'eye of the hurricane' at the construction site and only see the problems to be solved here and now, at the very short term - to avoid a halt in the construction process. Others see opportunities to reform the construction industry based on detailed analysis of how the industry works and especially why it performs as poorly as it does. But in order to improve performance, insight knowledge and a visit to 'the machine room' of construction is necessary, as Ball (1988 p. 2) draws attention to in the British context:

> "…the industry can only be adequately understood in terms of the complexity of its social relations, its history and the overwhelming dominance of large-scale capitalist enterprises. Such an argument contrasts, in particular, with interpretations of construction which externalise its problems. Governments, economic fluctuations, trade unions, planners, even nature itself have been blamed for construction's ills, while remarkably little analysis exists of the peculiarities of capitalism in construction itself".

There is a considerable risk that the 'reformer's approach' quickly gets overwhelmed by the construction industry's many complex problems, causing people to lose their sense of direction, resulting in inevitable, endless discussions and to forget the long term transformation of the industry.

My concern is not whether consultants, contractors, developers and clients earn a high or low profit, but to analyse internal *systemic barriers* to the transformation of the industry, like that of most other industries, regardless of whether the present actors in the industry want this transformation or would rather continue the craft era production.

Therefore this thesis adopts Mies van der Rohe's transformational point of view and a bird's eye view of the problems. This involves both a historical and a transformational perspective, where the other industries' alteration from craft to industrial production is vital. In this thesis the focus is *not on reforming but on remoulding the construction industry*. This perspective moves the need for knowledge from 'the old building industry's internal problems' to such new knowledge that allows the understanding of the barriers for this alteration. However, this involves the comprehension of the 'basic systemic problem', and knowledge about 'transformational leadership' and the 'creative' form of knowledge, as described in Chapter 11.

1.1.1 Is construction backward or just different?

For decades it has been the assumption that the building industry is backward according to Ball (1988) who finds it difficult to compare the craft techniques of a skilled bricklayer with the capacities of a computer-controlled machine tool. In his opinion, all that can be said empirically is that building work is different from other productive activities and uses considerable amounts of labour, which is to say a lot and very little at the same time. He finds that production methods have changed dramatically over the past 100 years in virtually every type of building work and continues:

> "More worrying than poorly-formulated empirical comparisons are the theoretical implications of the backward view of the building industry. Why should the future technical development of construction necessarily be towards more and more factory production? An unwarranted idealisation of particular methods of production seems to be elided with a very essentialist view of technical change. Yet, without such a view of the perfect universal technology applicable to the production of everything, how can you compare technologies on a scale of backward and forward? Is the latest generation computer more technically advanced than the most recent piece of genetic engineering? Is an elephant more technically backward than a race horse? Outside riddles in the style of Lewis Carroll, such comparative exercises have no meaning. The backward view of the building industry is asking the wrong question." (Ball 1988 p. 32).

This thesis will focus on the basic transformational problems which have to be understood before a meaningful debate on the 'remoulding' of the construction industry is possible. That debate is much more important than the polemic rhetoric demonstrated here.

The subject has for decades been a *delicate topic*, but we do not have to compare 'elephants with horses' – it is of course more relevant to compare the productivity and outcome of different production modes and business models to establish which one serves society best. Today nobody would deny that the actual development - since the 1980s - clearly has demonstrated the use of more and more factory production of pre-fabricated elements, components, subassemblies etc.

Not only technically in regard to craft production, but also the business model, and leadership and management practice used in the building industry are performing worse than what is recorded in industrialised industries, see part II and chapter 10. (See also definitions in appendix C2 p. 178)

Altogether a rising understanding has emerged in the western world that the building industry, when compared to other industries, is lagging behind in

development, as the building process still includes 3 parties (client, consultants, and often several contractors), who also vary from project to project, or as Woudhuysen and Abley (2004 p. 1) put it:

> "Construction is backward. It is atomised in industrial structure, poorly managed in practice, and endlessly weighed down by regulations".

1.1.2 The time horizon of this study

At first a very long time-horizon was part of the title of this study – 'predict by an educated guess how the building industry will look like in 25 years'; but as the study progressed, it became obvious that the thoughts and ideas of this thesis can as well be implemented 1 year from now, as in 25 years. On the one hand the necessary knowledge and technology is available and can in principle be implemented 'tomorrow', but from a practical point of view, it is probably expedient to employ a learning process first. On the other hand it is impossible to predict when a major transformational process in the Danish building industry de facto will take place. Therefore, the horizon of this study is 'sometime in the future'.

Author's experience and approach

The Author has for the last 40 years observed the situation in the building industry with surprise, as I, with a dual background as both an architect from the Royal Danish Academy of Fine Arts and a degree in International Marketing from the Copenhagen Business School, have been able to discover the practical differences between working, respectively as an architect in the building industry and as a business consultant in international marketing for Danish international companies. While I have seen the building industry as a conservative, rather closed world, with widespread neglect of the industry's problems; I have experienced the global companies like almost the opposite: Open and ready to learn. But the most obvious difference was the two sectors in regard to leadership and management. While the building industry was largely averse to the concept, the international marketing world could not get enough. The same applied to differences in production, procurement and buyer perception etc.

I have worked with transformational processes in the building industry as a research architect at SBI (the Danish Building Research Institute) with experimental housing, planning and construction principles; as a lecturer in the educational system (the architectural technologist education); and in international

companies with teaching the marketing staff to adapt their international marketing to local culture in the complex Japanese, Chinese and Middle East markets which in turn implies transformational problems that needs to be dealt with in both time and space. What is marketable in one culture might be forbidden and impossible to sell in another.

This dual experience has provided me with the knowledge that an industry does not have to get stuck in a static culture, in pre-industrial business and production modes. But gradually, I recognised that the reason for these differences probably is 'systemic' and not due to a simple lack of ability or will to change the building industry. Instead, maybe the 'systems' in the two sectors are to be seen as incompatible, different worlds that no longer consist of interchangeable elements. Modern leadership and management may simply not be applicable in the building industry, as it is? That is the reason for the hypothesis, tested in this thesis.

It is not a law of nature that the building industry stagnated, and it is of course possible to transform the industry; but *the first step is to recognize the nature of its problems*, which perhaps is best done by comparing the building industry with the 'industrialised industries' (see definitions in appendix C2 p. 178) and the way in which they function as a basis to discuss the most interesting future question: How is the transformational process best implemented in the building industry?

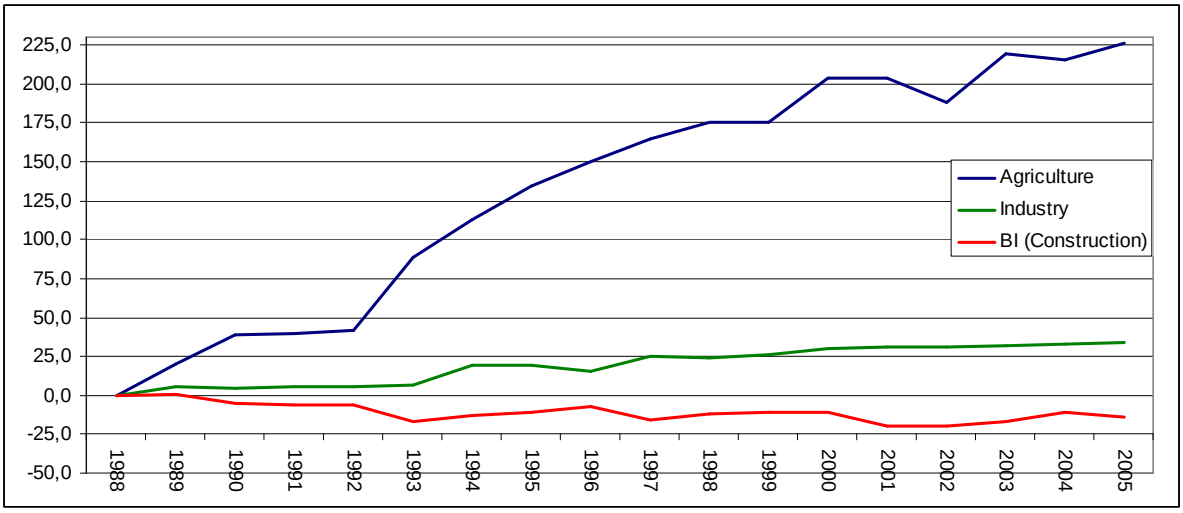
Consequently, this study was changed into an analysis of, whether there are systemic barriers for the transformation of the old buyer controlled building industry to a contemporary seller driven industry, which uses modern management to control sales and production etc. as discussed in part II.

1.2 The social aspect of decreasing productivity

While most sectors in the Danish economy have been industrialised, the building industry maintained its old craft based traditions and culture. The lack of development of the building industry has consequences, which leave traces in the economy, perhaps best illustrated by its productivity trend - in a period when virtually all other sectors increase their productivity; the building industry has a decreasing or stagnating productivity.

Comparing the Danish economic sectors, it is evident that agriculture (traditionally even more labour intensive than the Building Industry) has achieved significant increases in productivity after being mechanized, automated, computerized and managed from the 60s onwards. Industrialised production in general also shows an inclining productivity. The 'odd man out' is the building industry (here equal to the building process, see section 1.3) with a declining productivity and a slower pace of development than the rest: The building industry has remained labour intensive, lacking the industrialisation of other sectors, see figure 1.

Figure 1: Productivity in agriculture, industrialised industries and the building industry.



(Author's graph, based on the Danish Statistical Office, adapted from NAT23)

The social obligation to increase productivity in the building industry was recognised long ago, e.g. emphasised by SBI (1968, pages 6-7), The Danish Building Research Institute:

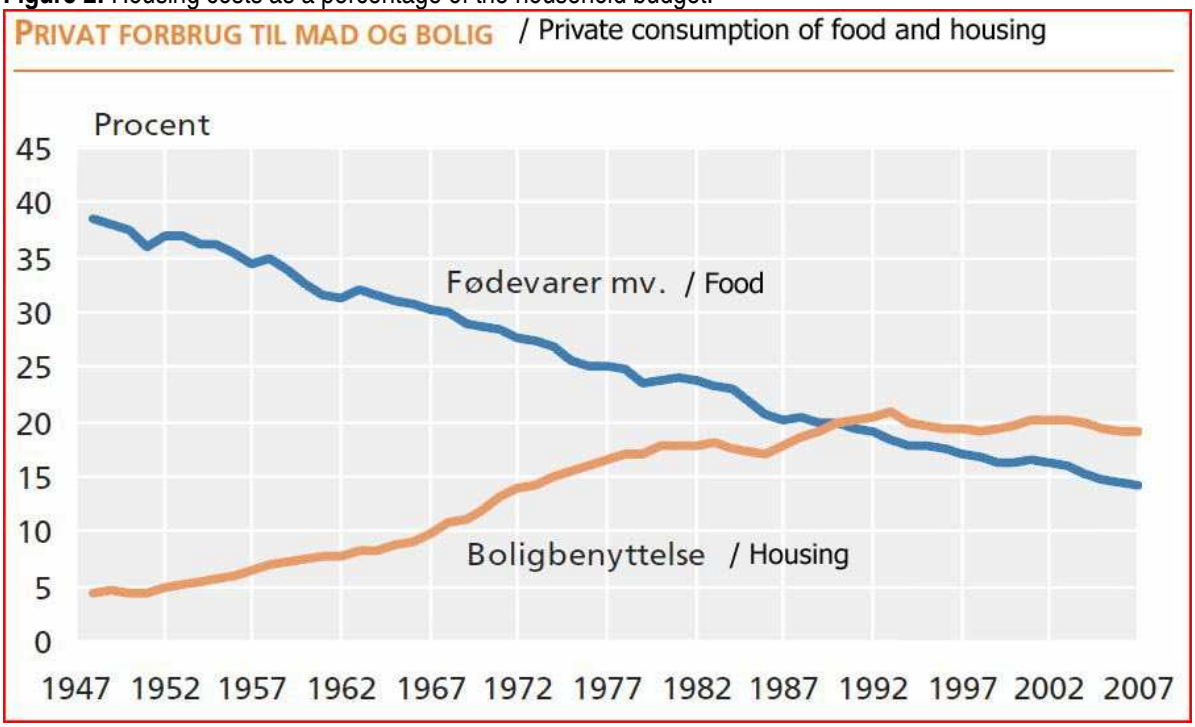
> "The building industry must, like other industries contribute to society's general prosperity increase. This requires an increase of the productivity in construction; i.e. the production of more building value with the same effort" (*Author's translation*). See also section 10.2.

Instead, there has been a tendency to almost exclusively explain the rising cost of housing by focusing on the speculative and financial profits, which are well illustrated by the turbulent fluctuations in the real estate market. These factors however, represent a different environment that has its own problems, which might confuse the picture, if they are included here on top of the building industry's own set of problems. Therefore the financial aspects are outside the framework of this study, see also section 1.3. I shall instead point to the influence played by the unsatisfactory productivity development in the building

industry, because production costs after all play a role for the bottom-level pricing. In new construction, for example, it is not the usual intention to produce to sell below production costs.

The effect of this weak productivity trend is that buildings over time become relatively more expensive, while food and most other industry products become increasingly less expensive (see figure 2 below). While for instance **a worker in the building industry** during the last 40 years has paid a still smaller percentage of his wages for a new colour TV, because productivity gains from industrialisation and mass production has caused prices to fall; **a worker in the industrialised sectors** in the same period has had to pay an increasing percentage of his wages for a new home and he has not been able to benefit from productivity gains in the building industry.

Figure 2: Housing costs as a percentage of the household budget.



While food represents a still less percentage of the household budget, housing represents an increasing percentage (Danmarks Statistik 2008, p.14).

Figure 2 shows an average for the whole country. In the larger cities the situation is more extreme; here housing might consume 30-40 % of the household budget - not the least because of the higher land prices in these cities.

So the lack of development in the building industry has social implications and has imbalanced the terms of trade between building workers and workers in the industrialised sectors. This is still the case even if we disregard the fact

that homes also have been subject to speculation profits and galloping prices on land, explaining some of the increasing prices. However, the crisis in the housing market from 2008 has reduced market prices of new homes, but thousands of new flats are still unsold after the profits have been 'disregarded', indicating that there is more to the problem than mere profits.

But nevertheless, the development of the building industry has had a relatively low priority in Denmark over the last decade, and the problem with its productivity level and associated business model has also had a low priority in the literature. Until around 2000 there were several serious attempts to explain and to change the situation (SBI 1968; SBI 1971) and (Boligministeriet 2000) but until now with little success.

In the industrialised sectors, 'leadership and management' in its broad sense was the single factor that led to the greatest productivity gains (see chapter 10). Surprisingly, the relationship between the progression of leadership and management and productivity has not been scrutinized in relation to the building industry. Therefore this is part of the focus in this study.

Thus, in the present-day economy, 'industrial production' and 'preindustrial building activities' coexist side by side as two different modes of production, and furthermore each with its own characteristic mode of leadership, customer perception, procurement process etc.

1.3 Delimitations and the scope of the study

It is not possible for this study to embrace the whole building industry and every aspect of it. Therefore this thesis focuses on: The *production* of new buildings, predominantly 'housing', and its associated *business model*.
Some segments of the building industry still benefit from the old craft production; others do not. Most of the new buildings are suitable for prefabrication and industrialisation. Their users (and society) suffer from the stagnating productivity in the industry and would benefit from industrialisation and an up-dated version of mass production that breaks with the monotony that characterized the first Danish industrialisation wave in the building industry around the 1960's (1955-75) and its early examples of prefabricated housing.

On the other hand, this study does **not** include:

- The market segments: **Refurbishment, restoration and renewal of old buildings** or **Maintenance,** which probably profit from (and sometimes depend on) hand craft production on site. But for a number of reasons the old building process will often be more competitive than an industrialised process in refurbishment etc.: If the building is not demolished, the production has to take place on site. The arrangement of the building site is often complicated by road traffic, residents still living in the area, no free space for storing materials, machinery etc. Often the refurbished result has to blend in with the old hand crafted building that is left untouched etc. So in a Danish context the old craft production will probably be relevant for years to come in this segment, although the use of prefabricated subassemblies probably will increase in this segment as well.

- The leadership and production of **building materials, components, and subassemblies**, because the production of these items is already highly industrialised. According to Danmarks Statistik (2007)[2] materials, components and subassemblies are classified as manufactured or industrially produced, while activities according to the old building process are classified as building or construction work, which still predominantly takes place on site[3].

- Therefore when this thesis refers to the building industry / construction industry, the *focus is on the relationships within the building process.* The production of building materials, components etc. are *not* included. The two (production of materials and the building process where they are utilised) represent different production modes: The industrialised production of building materials with an inclining productivity and the building process with a stagnating or declining productivity, quality problems, poor customer satisfaction etc.

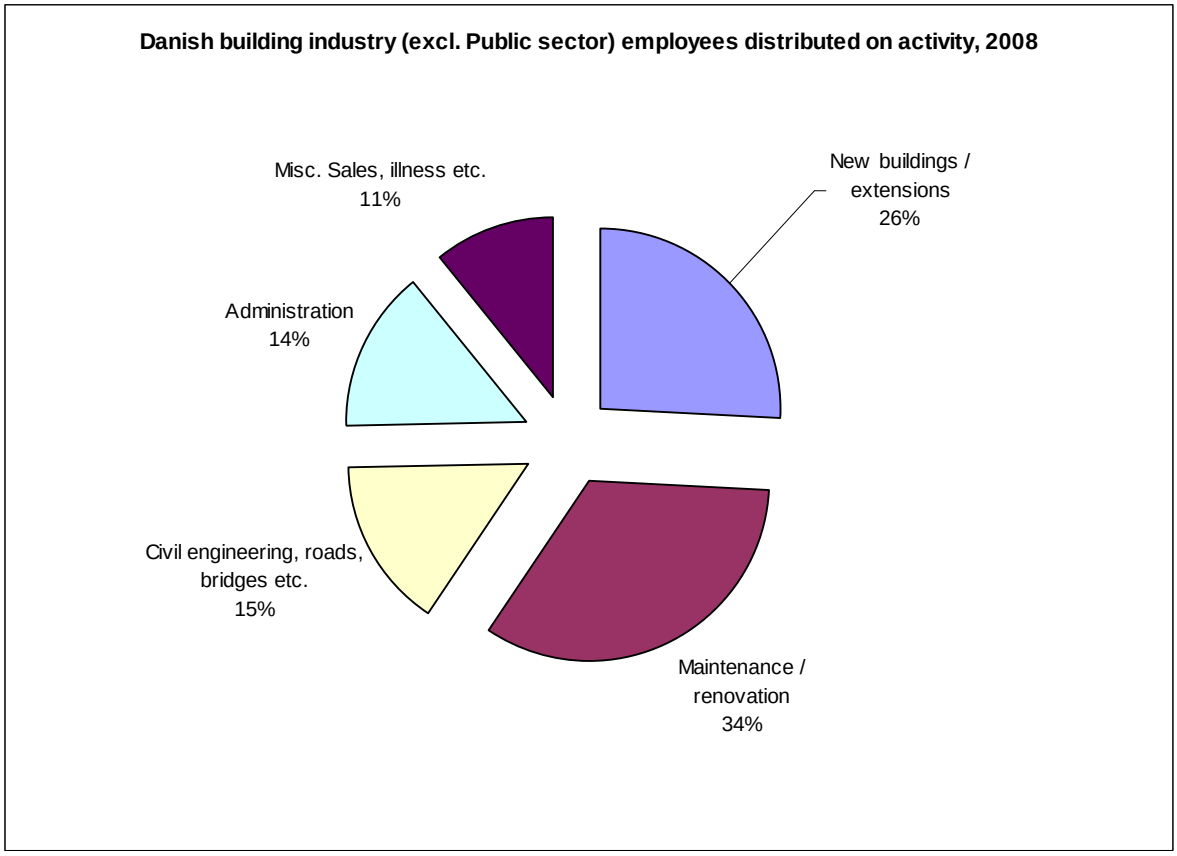
- The **speculative and financial transactions** that often play the most important economic role in the housing market are disregarded in this study in order not to 'confuse the picture' by introducing another environment and an entirely new problem complex. Controlling these important speculative

[2] The Danish industry classification codes (DB07).
[3] E.g. the production of paint or bricks (DB07 code 20+23) is recorded as industrialised production, while time spent utilising the bricks and paint on the building site in the building process is recorded under the construction industry (DB07 code 41+42+43).

and financial aspects of the 'buying and selling of buildings' in connection with the transformational process of the building industry, would be a natural subject to future research.

According to the above mentioned limitations, this study will affect approximately 1/3 of the totally employed work force in the Danish building industry. Those employed with construction of new buildings, plus some in sales and administration, see figure 3 below.

Figure 3: Distribution of employees in the Danish building industry.



(Author's graph, 2011, based on Danmarks Statistik, statistikbanken.dk/BYG).

1.4 The research problem, aim and hypothesis

The above mentioned issues in section 1.1 have given rise to many attempts to answer and explain, but before discussing what treatment should cure the patient, it is useful to find out what is wrong with the patient.

Therefore the **research problem** in this study is:

> Does the building industry significantly differ from industrialised industries and if so, how and to what extent are there barriers that prevent the building industry's transformation to an industry with a productivity level similar to other contemporary industries?

It might be easier to understand the problem in the building industry, if the focus is on: 'Why the building industry still is a craft based industry, when practically all other industries have been transformed' instead of 'what single initiatives must be taken to industrialize the building industry?'

And the **aim** is to:

> Investigate the preconditions for transforming the building industry into an industry in which leadership and management has the purpose to increase productivity, product development, customer satisfaction, and in general to contribute to society's general prosperity increase.

The **hypothesis** to be tested is:

> There is interdependence between the variables: Procurement Model, Buyer Perception, Mode of Production, and Leadership and Management in a certain industry.

If the hypothesis is accepted, this implies in the context of the building industry that: A transformational process to the Seller Driven Marketing Model is required, **if productivity is to increase, and result in price reductions for the customers and** the variables of the two models are **not interchangeable**, implying that systemic barriers exist.

1.5 The research approach

In this study, two things are examined: *First*, it will be established that the industrialised industries and the building industry are different environments, each with its own business culture, production mode and leadership culture. Next, if the result is a confirmation of the suspected differences, a comparison between the two industries, with the purpose of **testing the hypothesis**, and

the crucial statement – that there is **interdependence** between the mode of Production in a certain industry, the archetypal Procurement model, Customer perception and the kind of Leadership and management which is applicable to that industry.

If the hypothesis is accepted, it means that it is not fertile to try to mix the leadership systems or cultures of the old building process and the industrialised industries and very futile to attempt to transfer modern leadership and management systems to the building industry, as it is. The same applies presumably for industrial project management. Resources and energy should instead be concentrated on transforming the building industry to a fully industrialised sector with up to date production systems and leadership and management.

Therefore, it means that the craft era production mode will have a problem adapting the leadership and management, and technology commonly used in industrialised industries. What the hypothesis really states is that the craft production mode and its interrelated variables will have to fade away and to be replaced with a new industrialised and productivity based mode of production, in order to establish a new coherence between the mode of production, the leadership and management, the customer perception, and business culture to resemble the general standards of society.

Methodology

The 'old' building industry is compared with a 'new' imagined or hypothetical building industry that is modelled to resemble the common, contemporary industrialised industries. The two are confronted as a means to test if there are barriers for transforming the old buyer controlled building industry to a new seller driven, industrial concept.

The crucial question to be tested is, whether the elements or variables that characterize the old and new model are internally interdependent. Or expressed in another way: Do the two models represent two different systems, whose elements are not interchangeable. Signs of systemic barriers would indicate a system with interdependent elements. If the problems that separate the building industry from the industrialised industries in fact are structural or systemic, they would be of a nature, which makes the old and new industry

model incompatible and therefore they each would consist of interdependent elements which are specific to either the old or new industry model.

While it might be physically possible for the building industry to change a variable or borrow a single parameter from the seller driven industries, (such as for example the production mode without changing the procurement model – this is de facto what partly happens when the amount of pre-fabricated objects are increased), it is a precondition for this study, that a non systemic change of a single variable must result in both increasing productivity and lower prices[4] - to refute the hypothesis. See part II.

To evaluate the problem with the old building industry and how it is actually performing, the available statistical productivity data will be examined to analyse if these data support the research hypothesis. The quantitative data collection serves as secondary, supplementary research data in this study.

To illustrate what a transformational process might imply, a short description is sketched of what market segments to start with, the need for new business enterprises with integrated production and marketing and knowledge based leadership and management to enable a constructive learning process in the future seller driven building industry. See part III.

Finally a Delphi panel will be consulted in part IV to put into perspective the questions about barriers, why the building industry was never transformed into a seller driven industry, what the fundamental problems are and how the industry can be transformed and progressed.

Consequently a multi-dimensional approach seems expedient:

An analysis of the possible barriers to transform the building industry. (The primary approach).

An examination of secondary statistical data to analyse productivity trends and a possible consistency with the dominant business model, respectively in the building industry and the industrialised industries.

A supplementary Delphi Panel Consultation to collect primary data to analyze the current position in regard to transform the building industry.

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[4] In the first industrialisation wave during the 1960's in the Danish building industry, productivity did increase, but this did not result in lower prices or lower rent for the tenants, cf. figure 2.

2. The situation in the building industry

From ancient times, the production of a building (like any other object) requires at least two production factors: Raw materials and labour.
Typically the raw materials need processing before they can be utilised in the actual building process, and gradually this processing of materials developed into prefabrication[5] of ready-made objects, such as wall or slab elements, various components and subassemblies, ready to be transported to the building site and absorbed in the building process. Prefabrication is not a new phenomenon. In a historical context, the term relates to the era's dominant mode of production. If e.g. the antique Greek temples are disassembled, it is found that they all consist of standardized marble elements, which each have a name and a standard design (within the Doric or Ionian style etc.) enabling the elements to be prefabricated, using the production mode of the craft era.

The Danish prefabrication has been highly industrialised (Madsen 2000) since World War 2 and has formed its own industry: The building *materials* industry, which is not a part of the building industry, according to the Danish Industry classification code (DB07). The building process, which on the other hand largely defines the building industry, has changed very little over the last centuries (Østergaard 1999). Compared to other old industries, like for instance the textile industry that was part of the industrial revolution in England, the food industry (Carlsberg produces its beer to the Danish market in one automated brewery with practically no employees), and the shipbuilding industry, which in many ways faces a complexity that resembles that of the building industry, but has been transformed into a highly productive industrialised industry (Byggepolitisk Taskforce 2000), the building industry is still basically craft based - this represents an important difference.

[5] **Prefabrication:** From 'factory' that derives from Latin *fabrica* (craftsman's workshop), origins from 'faber' (craftsman). Prefabrication originally means something that was made in advance in a craftsman's workshop. In a modern industrial context a factory is a building, which forms the framework for an industrial production. Prefabrication indicates that things are made in advance in a factory.

2.1 The old building process

Originally, the production of building materials and the building process itself were not divided: The carpenter felled trees, stored and dried them and cut his own boards from the raw timber; and the bricklayer burned his own bricks on site and made his own lime and mortar etc. Later on, work division and better transportation potential enabled sawmills, and brick and mortar works to supply readymade materials to the building process, so it became easier and faster. But contrary to most Danish industries, which were industrialised during the late 1800s, the Danish building industry remained a manual work place with roots in the medieval guild and apprentice system (see appendix A p. 167).

The old *craft era building process* still determines (see section 3.4) the business culture, the procurement process and the construction process on site, where the work still is exposed to wind and weather.

Like in the pre-industrial period, it still requires a special and high degree of coordination of the building process to lead to a good result, because typically every building is unique and produced in one copy only, by a new team of consultants and contractors (Kristiansen, Emmitt and Bonke 2005). This does not promote the sharing of knowledge and experience based learning from bad solutions and defects. The project organisation itself (assembling project groups for each assignment) used in the building industry is seen as a negative factor, preventing innovation and change. No or little reuse of solutions (Østergaard 1999, p. 25) – no real 'object orientation'.

2.2 Prefabrication

In the post World War II era, there has been a tendency towards developing a still growing number of prefabricated objects in construction. 75 years ago, it was not unusual that a building was erected using only about 50 different building materials and the craftsmen knew all the corresponding standard constructions (Kjærgaard 1948). Today the architect and contractors can choose between perhaps 50.000 different materials, components etc. (HFB 2011), but paradoxically, these many new prefabricated objects have not eliminated the old building process - only made the processes more complicated. Just think of a phenomenon like the damp proof membrane in connection with insulation and the attempts to make it air tight with tape, sealants etc. (which are all new materials that again require new processes)

and the possible moisture problems that might occur inside the construction, when performing this standard construction incorrectly.

However, it is interesting that the building material industry adapted the industrial production mode, which also implies that the producer is responsible for product development, marketing and often produces for stock. For instance a window producer typically is able to produce window elements according to the customer's drawings and measurements at the same price as standard window elements, using CAD-CAM technology and thus is able to make use of 'mass customization', which represents the best from both the industrial mass production and the craft era's individual adaptation.

All in all, the building material industry and the building industry (here = the old building process) are two different industries that each use their own mode of production, leadership and management, procurement model, buyer perception etc.

All things being equal, the use of a growing number of subassemblies and prefabricated components should result in an increase in productivity, especially when measured only on the 'building process' (= the building industry without the building material industry). But this did not happen (see part III) thereby possibly indicating that the limit of the craft based production has been reached?

Likewise, the growing number of prefabricated objects was expected to increase productivity, by advancing the object orientation that the CAD firms promised and in this way participate in eliminating the old building process, but it has not happened yet (see part III). Perhaps, because the objective of these developments was not explicitly to replace the old building process and its business model? See example in section 3.2.

Prefabricated homes in Denmark were developed and built after 1950 and peaked in the 60's. According to Bertelsen (1997) they were composed of industrially manufactured wall and slab elements etc., brought to the building site where they were assembled. They reduced manual labour on site, could be produced on a semi industrial basis, and in the shelter for wind and weather, giving a smoother construction flow year round. Among the disadvantages are the expensive production equipment and transportation problems. **But the**

building process in itself, the procurement model[6] etc. remained unchanged. However, in the 1960's the first serious increase of productivity in the building industry was experienced, as a result of semi-industrial prefabrication – but at the expense of both quality and architectural design, causing the progress towards further industrialisation to slow down. The tenants and the population were not fond of the monotonous building style that was a result of the crane rails that were necessary in those days to assemble the concrete elements. And more importantly, this kind of industrialisation only resulted in increased profits, larger flats, and seldom in a lower rent (see figure 2 on p. 8).

In today's Danish building industry, the carcass of larger buildings is typically assembled using prefabricated building elements etc., accounting for about half of the work on a building. The rest is hand-made on site and the whole thing is still organized using the old building process and business culture, causing the buyer's situation in the building industry to be different in comparison with other industries. **To illustrate this and the overall problems** in the building industry, it might be helpful to use two analogies, one from the textile industry, which was one of the first industries to undergo the transformation from craft to industry via 'manufacture' and another from the automobile industry, which developed the assembly line:

2.2.1 The degree of prefabrication and industrialisation

A woman, wanting to buy a new dress, can choose between three options: She could go to Paris and buy **'haute couture'** – a one of a kind model – personally adapted and with a unique design. Handmade, using the old 'skilled craft' production mode. The price might well be £10.000. (This segment would probably only represent a very small fraction of the total market size and the competition would not focus on the price parameter). Modern industrial production would in this case be to shoot a sparrow with a cannon (Danish saying).

A second option could be to visit a **local tailor** and commission a personally adapted dress with a design from a model book. The dress is

[6] The procurement model describes the process according to which a building is acquired with focus on, who has the initiative and controls the process and is not intended to include forms of contract etc.

produced according to the old 'skilled craft' production mode, but with catalogue design and premade patterns. The price might be £1.000.

The third option could be to visit the local **department store**, choose between a diversity of designs and buy a mass produced dress, industrially manufactured in a range of sizes. The price might be less than £100 and for this reason most customers find their way to the department store. (This low price is only possible because the mass production is highly industrialised).

2.2.2 An example – the contrast to purchasing an automobile

The Danish building industry still use the 'haute couture' option as the standard procedure, unless it is a catalogue house - then the tailor option might be used. The industry has barely begun using the third option. This is strange because the customers would never accept to buy for instance a car (which resembles a building in complexity) in the way the client procures a building according to Madsen (2000), who inspired the following description.

Just imagine a world without **car producers and car dealers**, causing the customer to have to consult a car designer first and once the design was agreed upon, the customer would have to get the design approved by the authorities. Then he would have to organize a tender before the production could start. Having found the best bids and drawn up contracts, the customer would now have changed his role from customer to 'client' with leadership responsibilities.

Now a body shop could start building the body work of the car, and at the same time the wheels, the electrical circuits, the instruments, engine, gearbox etc. would have to be made by subcontractors and all the parts would be assembled at a garage by skilled mechanics.

Like in the building industry some of the subcontractors most likely would be delayed and the whole production process would stop. Also some of the parts might not fit in exactly as they were supposed to, because of inaccurate design or production and some subcontractors would deliberately produce their part exactly according to the wrong design well knowing that this would result in the part becoming useless. The client would find that he, as the leader of the process is expected to coordinate all the subcontractors, which is quit a job, frequently resulting in disputes and litigation. However, once the car was finished with a long delay and handed over to the client, he would most likely notice some defects. If the window in the door could not open, he would

probably experience that the body shop would blame the lock maker and vice versa and perhaps, the client would have to settle the case and pay a part of the remedy expenses, now knowing that there is no real effective guarantee when you commission automobiles.

For these reasons customers have fled from this procurement system, production mode, leadership and business model since cars replaced the horse-drawn carriages. But this procurement model still represent the standard procedure in the Building Industry, only it is performing worse than in the old days, and it causes trouble in regard to 'customer relations'.

The contrast to contemporary computerized and robotized automobile production is strikingly painful. Most sectors have managed to develop their mode of production away from obsolete manual workmanship towards automated industrial production; e.g. using CAD-CAM routine operation, having moved away from tenders as the predominant procurement system towards a marketing oriented system where the seller initiates product development in order to satisfy customer needs and wants using 'mass customization', driven by a corresponding leadership and management system which all together have inclined productivity to the benefit of the customers.

However, to speak of 'mass customization' presupposes two things: *First*, the customer concept must already be implemented (the transformation from client to customer must have taken place), and *second*, the mode of production must be industrial (mass production) or more likely 'late-industrial', in order to make use of CAD-CAM production. To speak of mass customization in a context with craft production and the client concept, represents wishful thinking and only increases the conceptual confusion.

2.3 What distinguishes craft production from industrial

The transition from craft to industry is probably rather vague, so what criteria could be used to determine whether a building is industrially produced, given the special conditions that apply, when the construction site (the place of assembly and production) constantly varies? The above mentioned examples indicate, what should be changed, but for our purpose, we will focus on:

- Reiteration – multiple copies of the same design.
- One business enterprise with one leadership for every project (SBI 1968).

- The quantity of manual work performed on site and the degree of prefabrication.
- The type of work performed on site.
- The business model used (see chapter 5, the procurement model).

E.g. assembly work on site belongs to the industrial era; while on site surface finishing work belongs to the craft era.

As long as prefabrication mainly includes raw wall and slab elements plus various single components, all the completion and finishing works are performed on site, using the pre-industrial procurement and business model, the building process belongs to the pre-industrial craft era.

But altogether *the* most important feature of the **Industrialisation Process** (Mørch 2009) is to realize that:

- **Production and Sale** are each other's premises.
- It is about **Routine production** to '**unknown customers**' instead of 'projects' to a commissioning Client.
- To control this, **industrial Management** is required.

This will be elaborated in the following chapters.

3. The problems in the building industry

While the Danish industrialised industries and service industries since 1970 has experienced a significant increase in productivity with a corresponding development of leadership and management, the construction industry has lagged behind, with humble profits, product quality, productivity, cf. for example the industry's own clarification report, 'Projekt Hus' (Boligministeriet 2000).

3.1 Experience based learning does not work

It is a long-held general assumption, that experience based learning leads to gradually more effective production (Kreiner and Kristensen 1991). But in the construction industry 'learning' works differently because of the industry's special fragmented structure and the complex nature of collaboration in a building project. The agents in the building industry learn the 'wrong' things from cooperation. All participants must cooperate loyally, if it is to be beneficial to all. If one contractor breaks the cooperation and sub-optimize to his own benefit all the other collaborators suffer (e.g. arriving too late, doing the job in another way than expected, causing the others to have to change their work etc.). The typical situation is that the ideal cooperation is almost non-existent. Instead, the agents learn the bad habits, the dirty tricks that enable them to serve their own selfish interests, in order to cope better in the special arrangement, called a building project. In the end this decreases productivity and therefore leads to higher prices for the client. An example of this could be a contractor who deliberately submits a bid that is too low and therefore constantly is claiming that 'this and that' is 'extra work', for which he is taking a very high price.

The learning in the building industry is all too often 'destructive' and private, whereas the problems are systemic. There is no systemic learning, since the system is too complex for the individual agent, who cannot foresee what happens, if changes are made and become contrary to change (Benspaend 2011). Therefore, there is a need to clarify what the 'systemic' problems in the building industry really are.

3.2 Historical attempts to increase productivity

In 1903 the engineer (and so-called father of Scientific Management) Frederick Winslow Taylor stated that industrial, large scale production could not be organized according to the old principles rooted in the medieval guild and apprentice traditions (Brown et al. 2005). Scientific management was based on standardisation, time studies of work processes, work division, specialisation and the removal of redundant, traditional work processes.

According to Brown et al. (2005) USA around 1900 could not compete with Europe because of its lack of skilled workers. Therefore it was a natural thing for Taylor to try to ***transfer the knowledge of the skilled workers to machines and the industrial process***. These measures presupposed Henry Ford's implementation of the assembly line in 1913, which doubled work productivity.

The Danish building sector did not adopt such measures and carried on as usual. The building industry saw itself as 'culture' - rooted in a tradition that included an old leadership, education and business model – and not as mere 'production' (Østergaard 1999).

A shift away from production in small craft firms towards mass production in large scale industrial business enterprises normally results in the craft firms being eliminated from the market, because mass production typically will reduce prices so dramatically that the small firms will be unable to compete. This is the kind of innovation that Schumpeter (1942) described in his theory for Innovation ('Creative Destruction'). The stagnating routine that does not benefit the customers is bound to be removed by new commodities, new technology, and new ways of doing business.

But paradoxically Schumpeter's Creative Destruction did not work in the building industry, presumably as a result of the public regulation of the industry: The legislation, regulating the sector is out of the ordinary with special Contract law, and special regulation of procurement, which require special educational programmes etc. The economy in the sector is special, because it is subsidized, and used by the state to regulate the post-war economy. The high manpower rate and corresponding low mechanization / industrialisation of the sector provides the sector with a direct effect on demand. Money saved or spent on this sector effects employment in the most

immediate way. But also this regulation provides the sector with an option to a total erasure of the old building process (= the building industry); an alternative development route might be a planned, gradual transformational process for the building industry, regulated and funded by the government.

3.2.1 Gutenberg's innovative production and sale

According to Mørch (2009) the first real attempt in industrial production took place 550 years ago. It happened, when the handwritten scripts were replaced by the letterpress, which rapidly spread to most of the developed Europe in only approximately 50 years (Mørch 2009, p 126):

> "Gutenberg and Neumeister were craftsmen, but they produced the first real true industrial product known to man: By means of division of labour and machinery they mass-produced a complex but uniform product to an unknown group of buyers. The generated product - the printed book - was not only cheaper to produce than the handwriting which preceded it, it was also qualitatively infinitely many times better and it was precisely these quality improvements by industrialisation that came to mean so huge a shift that it may even be worth considering whether it was on this occasion, the modern world emerged. Here is truly a technological breakthrough, a shift in quality from something inferior to something crucially new and better". *(Author's translation)*

As described by Mørch (2009) two interrelated changes in this example are important. *Firstly*, the new industrial production mode is vital, because it breaks with the hand copy, craft mode and creates a new industrialised mode that produces better quality at a lower price. *Secondly*, the printers were willing to produce to "an unknown group of buyers" and not to a commissioning client as they used to.

This represents a whole new situation, where the producer is the seller, who initiates the production, decides what book and how many copies he would print, to whom he would sell, and how he would do this. A new approach that stands for the real innovation, which during the next couple of hundred years developed into a new procurement model, which was *seller driven* and not controlled by a client. In this seller driven model, production and sale are interrelated and interdependent activities as Mørch (2009) mentions. The one cannot exist without the other, and the real difficulty proved to be finding customers in sufficient numbers. This challenge demanded that the seller could imagine the needs of customers and was willing to develop his product so it satisfied those needs. However, it is essential to understand that the interrelated production and sale did not work properly until it was recognised

centuries later that both have leadership and management as their premises. Both Gutenberg and Neumeister went bankrupt, and did not profit from their innovative creations. Therefore a description of the interdependent relation between production and sale in reality is a description of leadership and management, as will be discussed further in part II.

If the Gutenberg example is compared to the building industry, it is evident that the two industries have followed different development strategies. The building industry has sought to replace an increasing part of the work on site with prefabricated building elements, components and subassemblies, but have kept the old building process, procurement model, and the commissioning client. *This strategy is equivalent to a situation where the scrivener uses prefabricated ink, paper and pen to copy books: The result is still a hand copied book, which lacks the qualities of the industrially produced prints, and not the least their lower price.* **This comparison illustrates the status and problem in the construction industry.**

3.3 The stagnating productivity is only a symptom

Something went wrong in the management of building projects according to BUR (1990) that described that the input of man-hours in 1986 was twice as big as seventeen years earlier in 1969 when comparing similar building projects (Kristiansen, Emmitt and Bonke 2005). The declining or stagnating productivity in the building industry is only a symptom and not a problem in itself. Lack of development of the production mode, leadership and the business culture plus problems in relation to the educational system, which has to differ from other parts of the educational system, because the industry is special, are basic systemic problems of a serious kind that are bound to cause productivity problems. This will be examined further in part III.

In order to devise solutions for the future progression of the building industry, whether that being a gradual or a full (destructive) transformation, it is necessary to understand the fundamental problem that is causing the need for change.

For the *architect's office* the inadequate development of the building industry environment might potentially result in severe consequences, because even

though the architects are not directly involved in the production mode etc., a scenario of the future development could easily influence both the nature of their work, and the organizational framework in which their creative work is carried out, e.g. their existence as independent consultants. The implementation of for instance a 'one unified production – one leadership' concept would easily change the status of the architects to ordinary employees in larger building companies.

3.4 Three production eras and their related output

According to Brown et al. (2005 p. 26) man has seen three eras of production: *Craft, Mass production and 'the current / future system'* (e.g. mass customization). In this model, development takes place from one step to the next and usually one of the steps is not skipped. This model fits most industries, but there is a problem if the industry does not clearly belong in one era, but contains elements from two or three, like the building industry. If the *society type* as an element of the study is included, it would be evident to subdivide the Western society types from the last centuries into a *pre capitalistic, a capitalistic and a late capitalistic society type*. But while the society type and production mode, typically develop as a pair (cf. Marx 1970), little attention has been given to how the leadership type and customer perception are related to the first two. Literature has only scarcely been dealing with the relation between the production mode and the corresponding leadership and buyer relations, if the examination does not exclusively describe the industrialised period that gave birth to factories, scientific management, organizational experiments and sophisticated leadership and management systems. As for the present, late capitalist era, many attempts have been made to attach a distinguishing term to it: Network society, global society, information society, knowledge society etc. Qvortrup (2003) argues that complexity seems to be the most striking characteristic of our time and therefore simply calls it "The Hypercomplex Society", where complexity refers to a situation with more elements than can be related to each other. With a growing number of actions and conditions, the number of relations also grows and we potentially have a hyper complex situation: The complexity of complexity (Qvortrup 2003 p.35). This thesis applies this term, because it sums up what it is all about in an era of transition: It is not just about information or

networks etc., but about the totality of all the elements in the present process of change. For the purpose of contrasting the building industry, the main society types are related to a certain archetypal combination of production, leadership, and buyer types in the following table to describe the historical progression of the typical relation between those elements - to put the situation in the building industry into perspective:

Table 1. Society type and associated variables.

Society type:	**Pre capitalism** (Until ~1850)	**Capitalism** (From ~1850 – to its mature type from WW2 to the 1980's)	**Late capitalism** From 1980s to today: Global capitalism / the Hyper-complex society
Production mode:	**Manual** craft production – individual adaptation	**Industrial production** – mass production for stock	**Knowledge** oriented production Stratification techniques are used together with CAD-CAM production to fine tune still smaller target segments (increasing individualization of consumers), e.g. "mass customization".
Leadership type:	**Apprentice and guild** system – focus on the trade	**Management** & traditional organizational thinking – focus on productivity and the efficiency drive	Distinction between **Leadership and management and project management.** Team leadership – focus on creativity and innovation to cope with rapid market change. Today's building industry exists in a modern hyper complex society, but still uses a pre industrial leadership type, largely without management (see chapter 8).
Procurement and Buyer relation:	A commissioning **client** controls procurement and product development. In the building industry also with leadership responsibilities. (focus on compliance and pleasing the client)	A buying **customer**. Product development initiated by the seller, who uses the marketing concept to analyse and satisfy the needs of selected target customer groups.	**Customer integration.** Focus on collaboration with customers and their stakeholders on the satisfaction of needs and wants.

For instance a shoemaker in the *pre capitalistic* period applies the manual craft production mode in which the apprentice is led by his master, who is a member of the local guild, to protect the trade. He manufactures for a commissioning client, who will get individually adapted shoes, hopefully to his liking. During the *capitalist* period the shoemakers were nearly out-competed by shoe factories that industrially mass produced a variety of shoe models and sizes according to their own market analysis, and everything is controlled by management. The customers buy mass produced shoes from dealers who market shoes from many producers.

Most industries follow the above mentioned schematic model, but the building industry and the architect firm do not. Even though the building industry represents a quite considerable share of the GNP (~12 % on average in the first decade of this millennium, hereof new buildings ~ 4 % of GNP[7]), it has not changed like other industries and is left as the 'odd man out'. This has brought along negative consequences for the productivity in the Danish building sector (Østergaard 1999 p.13), which led to high prices of new buildings and problems with observing construction time-tables, quality, the procurement route, cooperation model and disputes. Problems that are similar to those described by Latham (1994) and Egan (1998), who initiated a debate in the UK about this that also spread to Denmark.

If we mix the variables between the archetypical society types, we get incompatible business systems: It does not make sense for the shoemaker to use management to plan and control his 'one of a kind' craft production, because he produces manually, for a commissioning client and not for unknown customers. Tradition and the apprentice system has provided him with the knowledge, he needs. Similarly an industrialised factory would not use craft production and leadership for its industrialised mass production. However, a factory in the late capitalist era would be able to use knowledge integrated production to customize the products to meet individualised needs. Therefore, the arguments against industrialisation and its associated management become fewer and fewer.

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[7] Source: Statistikbanken.dk/NAT

In this way, each society type normally has attached its own natural production mode, leadership type, procurement model, and customer perception, as a set of interrelated elements.

3.5 The Building Industry is special

The Building sector has remained a partially closed, rather static system, allowing very little influence from the surrounding society to change the building industry "culture". Therefore the building sector typically is described as 'special' in comparison with other sectors - in Denmark and probably internationally (Østergaard 1999 p.17). The *production mode* e.g. is special because a relatively high share of the work takes place *on the building site* (where the production time is used 1/3 of the time for actually working, 1/3 for preparation and waiting for materials, while 1/3 is wasted) and not in factories and a lot of the work is still characterized by its reminiscence of craftsmanship (Østergaard 1999 pp. 24-25). This corresponds to the fact that in 2008, 56% of the workforce in the Danish building industry had received their *highest education as vocational* training (apprentice system + school), and less than 1% had a university degree (see section 10.5), indicating that industrialised production is not the predominant production type, because industrialised production in the building industry does not require skilled workers in those numbers; only unskilled workers and more employees with an academic education. Also the business culture is special with *procurement procedures* and customer relations originating *from a time when everything was commissioned and not just bought*. All these peculiarities are rooted in pre-industrial traditions that used to be common to all trades, but have vanished from nearly all other industries today.

The building sector had the attention of the former government (until 2001) and a number of reports have been produced by Danish research institutions and the government (Boligministeriet 2000) focusing on the declining work productivity, the high prices and failing quality in the Danish building industry. But the liberal/conservative government (2001 -) stopped all the former government's initiatives to develop the building industry, threatened to close The Danish Building Research Institute etc., which led to a setback for the transformation of the industry.

3.6 Problems - summary

The factors, influencing productivity negatively, are:

- Typically every building is unique and produced in one copy only, by a new team of consultants and contractors (Østergaard 1999 p. 23). This does not promote the sharing of knowledge and experience based learning from bad solutions and defects. The project organisation itself (assembling project groups for each assignment) used in the building industry is seen as a negative factor, preventing innovation and change. No or little reuse of solutions (Østergaard 1999 p.25) – no real 'object orientation'.
- The procurement route with tenders and too many trades involved, does not promote competition (Madsen 2000; Østergaard 1999 p.19).
- Lack of leadership and management (Østergaard 1999 p.23). Lack of competence and education. Large number of small clients, designers, general contractors and sub-contractors, who are often not in a position to provide leadership.
- The production of building materials was industrialised, while the building process on site never has been changed (Madsen 2000; Østergaard 1999).
- Too expensive building materials (Retail Institute Scandinavia 2000) because of an inappropriate distribution system with too many or monopoly like channels and agreements hindering competition.
- An obsolete production model with too much manual work on site and too little prefabrication (Østergaard 1999 p.13). The business describes itself as delivering 'service' and not 'production'.
- Lack of cooperation: No training in and no incentives for cooperation. Too many conflicts and disputes similar to what Latham (1994) described in UK.
- The building industry is caught in a 'locked in' situation according to Byggepolitisk Taskforce (2000). *This report sums up that* ***the market mechanism is out of order****; the players in the industry, old traditions and political regulation of the industry have locked the situation to a degree that prevents innovation and an increase in productivity. Clients have formal leadership duties in the building process but rarely are capable to lift that responsibility, consultants usually get fees according to the production costs and therefore have no real interest in reducing costs, tenders simply do not fit a modern customer orientated market and fail to encourage competition etc.*

Although it is possible in recent years to find examples of developers and contractors improving market approach (Kristiansen, Emmitt and Bonke 2005), no notable positive effect on productivity and quality has been recorded. The symptoms have not faded away, the underlying problems still exists: The economy as a whole, and other sectors develop faster - the overall picture is still the same.

The exact nature of the problems in the building industry will be examined in more detail in the following; expanding the consequences of the lack of development and reflecting on the transformation possibilities for the industry.

PART II. BARRIERS FOR CHANGE?

4. Methodology

Whenever a building is erected, typically a certain process has been followed, and the procedure, still used in the Danish building industry, has basically not changed for centuries. As an experiment, I will try to imagine a new seller driven building industry, and confront it with the old buyer controlled industry, in order to examine the barriers for a transformational process.

4.1 The systemic variables of the building industry

The variables that are subject to this analysis have been selected, because of their role in the building process as distinctive systemic elements, and because they *cover the various aspects of the building process from the 'vision' of the future building via procurement to production and the leadership and management of the building process, as well as the perception and role of the buyer.*

In **the old building process** those characteristic variables also reflect the typical procedure: A **Buyer** (the Client with a 'vision' of some kind) initiates a particular **Procurement** process, which will determine the **mode of Production** of the building, which again will apply the kind of **Leadership and management,** which is pertinent to the building process. These four variables or elements are important descriptors of the old building industry.

4.1.1 A new, imagined building industry

It would of course be interesting to imagine, what a transformational process in regard to the building industry would imply?

In other words, what would happen, if the industry was transformed in a similar direction as Gutenberg's letterpress? Referring to this *example,* it is possible to identify the outline of a **new, imagined building industry** and to describe it using similar variables, as were used for the old industry:

> When **erecting a building, using the imagined, future model**, the producer (who typically also is the seller) will commence his *unified, industrialised mode of production and marketing process* in order to find potential customers, who will procure his readily made homes or buildings, which are erected under the seller's leadership and management.

When confronting the old and new building industry models, I will explore whether:

- The *Procurement process* in the old and new building industry is different and results in two models?
- The *Buyer perception* and the role of the buyer in the old and new building industry are different and result in two buyer concepts?
- The *mode of production* in the old and new building industry is different and results in two modes of production?
- The *leadership and management* practice in the old and new building industry is different and results in two kinds of leadership and management?

4.1.2 Research questions

This confrontation might suggest answers to the following research questions:

Would there be **barriers for transforming** the old building industry, based on the four variables mentioned above, to a 'new' imagined seller driven and industrialised industry?
Would the elements in the old and new building industry be *interchangeable* or would they be *specific* to their own version of the industry and thereby showing internal **interdependency**?

4.1.3 Test procedure

The hypothesis of this thesis will be tested by confronting the old version of the building industry with the new, imagined version in order to try to answer the

above mentioned research questions by testing the variables / elements one by one, to determine, whether there are systemic barriers for transforming the building industry to the 'new', seller driven and industrialised industry, and whether the variables are interdependent and therefore specific to its own version of the industry?

Table 2. The transformation process to be examined:

			Organisation & leadership:
		Production mode:	**From**: Building process leadership around the client. **To**: Marketing oriented leadership and management of the business enterprise supplemented with project management.
	Buyer perception:	**From**: Building projects. **To**: Unified production as routine operation in a business enterprise supplemented with projects.	
Business model: **From**: Buyer controlled procurement. **To**: Seller driven marketing oriented acquisition.	**From**: The commissioning Client with leadership responsibilities. **To**: Customers.		

5. Procurement Model

The procurement route with tenders and too many trades involved, does not promote competition (Madsen, 2000; Østergaard 1999 p.19).

The initial step in the transformation process has to do with the future business model. The procurement model describes the process according to which a building is acquired with focus on who has the initiative and controls the process. Representing the author's proposed conceptual formations, two models are investigated:

- **The Buyer Controlled Procurement Model, BCPM**, used in the pre-industrial building industry.
- **The Seller Driven Marketing Model, SDMM**, used in the industrialised building industry.

In extension of section 3.2.1, the impact of Gutenberg's innovative approach to book printing 550 years ago will be further examined. According to McNeill and McNeill (2003), Gutenberg's printing press was the most revolutionary development, which drastically reduced information costs. Mørch (2009) finds that Gutenberg and his fellow craftsmen founded not only the idea of industrial production but also a new way of selling and marketing products and consequently also a new way of acquiring products. Before then, most products had to be commissioned and manufactured for later delivery.

Gutenberg's innovation led to a new procurement model, where the printers were willing to produce to "an unknown group of buyers" and not to a commissioning client as they used to. The producer becomes the seller, who has the freedom to print the books he wants, and to sell to the customers he chooses. This 'reverse' order has been just as important for the productivity increase in the industrial period as the production aspect of industrialisation itself, because production and sales proved to be each other's premises, as Mørch (2009) calls attention to.

During the following few hundred years this 'seller driven procurement model' became the dominant way of doing business, because it entailed an incentive to develop the product, they were producing.

The printed book was a new product category, which required additional skills than was needed in the production, and which offered the new tempting opportunity to print many copies of the same book as the marginal cost of the last copy is very modest, once the lead types are ready and the press is running (Mørch 2009). On the other hand it was vital that the printed books were sold and preferably at once, since they needed the money to invest in the next book production - to keep the business going.

This model required quite a significant organization at that time: Suitable premises, machinery, types, tools, ink, paper and employees. Therefore the money had to be ready in advance to pay materials, repayments on loans and employees; otherwise the book was not printed or finished, which meant that their work was worthless. A half finished book is not saleable and therefore worthless. The risk of becoming illiquid was imminent, and that was what put an end to Gutenberg – for a while.

Product development by the seller

But these new demands on the seller influenced the product quality in several key ways:

The books got a title page, where you could observe the name of the book, the author's name and who had printed it.

Before, there had been no reason to do that, since the scrivener copied the book you had asked him to, and you had no problem remembering which one, for it was not many manuscripts you ordered copied.

All the books were identical, which allows the printed book some qualities that manuscripts do not have. Pagination made it possible to compile tables of contents and use notes and references, and this in turn led to other innovations such as the division of text into chapters with titles and subheadings.

In order to get the books sold, it was necessary to publish catalogues, where their titles were listed under one or another system, for example alphabetically. This was not necessary before, because the printers simply did not begin working prior to having an order from a buyer, whom they trusted could pay, when his script was finished.

For industrial products such as printed books, the situation was entirely new and untried. *The market had to be built up and it had to be maintained*. But at that time the printers had no experience in marketing and communication with customers, because it had not been required in connection with the handcraft copies they had hitherto known.

In other words, if the printers were not able to imagine the needs of the potential customers and did not meet those needs, they could not sell their products. They had to recognise that *the primary problem was obtaining customers in sufficient numbers in this new seller driven model and this was the issue that pushed product development forward*.

However, it is essential to understand that the interrelated production and sale did not work properly until it was recognised centuries later that both have leadership and management as their premises. The early book printers lacked this insight, because it did not exist as available knowledge at the time (see also chapter 14), and consequently Gutenberg did not profit from his innovative invention. Therefore a description of the interdependent relation between production and sale in reality is a description of the emergence and development of leadership and management, as will be discussed further in chapter 8.

The above description contrasts the situation and the problems in the building industry, which neither experienced any Gutenberg, nor was inspired by his invention.

But a similar developmental leap in the design and production of buildings and homes as well as urban planning is far from impossible, once product development is set free. After all, the design of housing, both apartments and family houses, has not evolved radically since the Roman period (Hill 1996 p. 98), while the satisfaction of human needs and desires in nearly all other areas has revolutionized our lives.

Nonetheless, as shown previously, the building industry never left the old buyer controlled procurement model.

In the following, a hypothetical transformation from the Buyer Controlled Procurement to the Seller Driven Marketing Model will be investigated as an initial means of identifying possible improvements in productivity, product

development, and to enable a reduction of product costs in the building industry (with the attendant civic, social purpose). The transformation is not used to explore the boundaries of what is technologically possible.

5.1 Who initiates and controls – that is the question

As shown above, there are in principle two different ways of implementing the buying process: Either the seller or the buyer initiates the procurement, and controls and drives the process forward. This distinction is important, because it determines the business culture, the procurement route, the leadership style etc.

Strictly speaking, it is the practice which is examined here, together with a set of related concepts, summarized into a pair of conceptual formations (models).

5.2 The Buyer Controlled Procurement Model (BCPM)

From ancient times, objects that had to be manufactured for later delivery were 'commissioned' by the buyer (Mørch 2009). This was the case, whether it was furniture, vehicles or buildings. There were e.g. no department stores that sold ready-made furniture. Every buyer had to commission his furniture at the cabinet maker's workshop, where he specified his needs and agreed with the 'producer' on the payment for the commodity. This pre-industrial procurement model still applies to the building industry, unlike most other industries.
In the building industry, the 'project' concept is grown out of the old BCPM.

At least from the Renaissance period, competition and tenders are introduced in order to create and develop 'competition' in the procurement of buildings. Originally the competition is about ensuring the best solution and the best quality, but gradually as the consultants feel they are able to describe and ensure the quality, the focus turns towards competing for the lowest price. These tenders are organized on the client's initiative and this procurement model is connected with the craft production.

So far, the ideal situation in the building industry is believed to require that the client initializes and leads the building process. The client examines his wishes and hires specialists to implement them. This should provide the client with a unique building, which only exist in one copy and includes 'product development' every time. In theory, an ideal situation, because customer satisfaction can be maximized (if the client knows his needs and the consultants are able to target those needs), but the question is whether this model in reality provides appropriate results?

In almost all other industries, buyers do not want and cannot handle the leadership task and have rejected to pay the premium price the model entails. A buyer with a choice typically has preferred a more passive role, where the seller has the initiative, takes on product development, management etc. because his knowledge of the market and the production process is much more comprehensive. See section 5.3 – The Seller Driven Marketing Model.

A. For the client the Buyer Controlled Procurement Model entails that he is not only a buyer, who wants to acquire a unique tailor-made edifice, but he also has to act as the principal with leadership responsibilities. Most clients are not doing well in this role and therefore experience a process which is only a partial success (Boligministeriet 2000). The client often employs consultants to help in this process, on project contracts. The consultants "compose the client's music" and prepare "the score". After the tender, the contractors "play the composer's music" to the extent of their abilities and that the music is playable, all things considered.

The client's management role depends on the contract model:

Trade contracts: The client has a leadership relation to both consultants and contractors. Typically the consultants perform construction management and production organization on the client's behalf. Often a very complex co-ordination and management role, because everyone involved has a financial interest in sub-optimizing instead of co-operating in the project.

Larger contracts with subcontracts: The management part of some contractors is left with one or more contractors.

General contractor: The client has only one contractor to manage. The main contractor manages all the subcontractors.

Turnkey, D & B. The client has only a contract relation to one party, the Design & Build contractor, who employs design teams or buys this function as a subcontract.

The D&B contract represents a beginning transformation towards the seller driven SDMM, because seen from the client, it resembles this model, but in regard to production and in every other way, it is still BDPM. The disadvantage for the client is that the D&B concept only works properly, if the client is able to specify his needs and wants in great detail – otherwise chances are that he will get less or something else than he expected.

B. For the consultants the Buyer Controlled Procurement Model entails that they carry out 3 necessary, interdependent tasks:
Design (Idea, function and form, etc.)
Construction (building structure, statics and design solutions)
Building process leadership, BPL (tenders, contracts, cooperation agreements, financial control, planning, supervision and quality control, work organization, etc.)

In the old days the architect carried out all 3 tasks, but the trend towards more complex buildings has necessitated specialization, where the architect focuses on the design and the engineer on the static structure. The leadership function is not carried out by any specialized profession - it is the neglected discipline.

C. For the contractors the buyer controlled procurement entails that they are to erect the client's building in accordance with the consultant's drawings and instructions, like the pharmacist in the old days made the doctor's prescribed medication mixture.
Often only one copy of each building is erected, making it a kind of prototype, which raises exceptional demands on the contractors; and this has not helped the contractors to industrialize the building process.

5.2.1 Regulation of competition

Architects typically regard themselves as independent representatives of the client's interests and very seldom take on the role of contractor or client.

To guard this independent role, most liberal professions have ethical guidelines in relation to marketing that regulate their internal competition. Within the Buyer Controlled Procurement Model the competition tools allowed, very often are limited to the 'telephone book' and various kinds of competitive tenders. Architects have this kind of regulation, too, and it is often limiting competition to so-called Architect Contests.

5.2.2 Architect contests

These contests are rather special, because they deviate from the standard norms in society in regard to how a "fair play contest" should be organized: First a detailed set of specifications for the project and the conditions, that regulate the competition, are set up. These are published together with the composition of the committee of 'judges', where the client typically is represented.

But after the contenders have handed in their contributions, the judges often alter the conditions and find a winning project that does not meet the project specifications and contest conditions (Kreiner 2005). The argument for this is said to be the desire to secure that the winning project in the best way suits the client's wishes. (This could be done by arranging a second round on revised conditions, which seldom occurs). In addition, architects often have participated in a prequalification round to be allowed to participate in the tender or contest. Seen from the participants point of view, this contest type is unfair (AA Newsmail 25-03-2010), because they spend a lot of money preparing their projects – but do not know the conditions, since they apparently compete blindfolded.

From the architect's point of view, the greatest increase in value of any project occurs in the first phases of the project, where ideas about form and function are added and the project is given a physical form. But in architect contests, the architects continue to give away these ideas, which are supposed to be the most valuable 'products' they have - in their own opinion.

This is just another indicator of a pre-industrial consciousness; the architects never developed a contemporary business understanding. This was

probably the norm in the pre-industrial era, when the client or landlord could treat his subjects, as he pleased, but shows again that the environment in the building industry is pre-industrial.

Apart from finding a winner, the side effect of architect's contests is a sort of 'product development' of the profession. In contests the architects 'play' with new aesthetic expressions, test new functional solutions etc. This aspect is probably the reason why so many architects find contests interesting.

5.2.3 The downside of the buyer controlled model, an example

In Denmark the public sector is the biggest client in the building industry and therefore the economic importance of the public sector affects the business terms, especially in a recession. According to the director of the organization of Danish Architect Firms, it gets more and more common that the public clients use their buying power to press the bidders in regard to the terms of tenders and contests (Lerche 2011). Frequently public clients demand deviations from the General Conditions for consultants (ABR89) and require the client's risks passed on to the architects:

> "We see claims for that the client, free of risk, and completely at odds with general contract principles, wants to be able to unilaterally terminate the contract and replace the consultant without compensation, although there is no breach of contract from the consultant's side. Intellectual property is demanded transferred to the client without compensation ..." (Author's translation.)

What is communicated here is that the public clients (that already control the procurement process) are exploiting architect firms by imposing unfair contract terms on relatively small firms, terms that are in conflict with the Phase model's basic principles.

All in all it is a paradox that consultants maintain their interest in the buyer controlled procurement model – but maybe the answer can be found in the pre-industrial mindset, see chapter 14.

5.3 The Seller Driven Marketing Model, SDMM

After the emergence of industrialisation and mass production, the buyer no longer had to 'commission for later delivery' the commodities he wanted. Typically, the initiative to produce was transferred to the seller, who 'produced

to unknown customers' and intensified his sales efforts and thus created today's predominant buyer model: The Seller initiated, controlled and driven marketing model. This model prevailed during the industrial period in the industrialised industries - but not in the building industry.

Gradually the seller, in order to market his products and satisfy the needs of selected customer segments, develops the marketing concept that manages product development, pricing, communication with customers and the development of sales channels.

In the growing markets that emerge parallel to industrialisation, the seller's initiative provides sufficient surplus to implement the necessary investments in production and product development, which in turn has led to a dramatic increase in productivity and corresponding lower relative prices. The Seller's initiative is first really possible with the industrialised mode of production, which leads to a change in business structure: From small family, craft based firms to big companies with a huge number of employees.

This model was widely spread after World War II and was supported by the teaching of 'the marketing concept' in American and European Business Schools from the 1970s onwards. The marketing concept was originally developed in Japan around 1650 by the Mitsui family, but first spread to USA and subsequently Europe after the American occupation of Japan in 1945 (Kotler 1980 p. 6). Except that it never spread to the building industry, which continued to use the old buyer driven procurement model.

The Marketing model, (see also section 10.1: The Modern Business Enterprise.) typically implies that the seller segments the customers and develops products to his selected target customer group in accordance with his market research. The seller produces his products and brings them to market using his specific Marketing Mix (Kotler 2010) - the 4 controllable P's:

- Product, decisions about the product (low or high quality etc.)
- Price, decisions about the price (low or high price etc.)
- Promotion - to support sales, the seller communicates with his potential customers in various selected ways.
- Place – sale through selected distribution channels.

The marketing concept includes stratification techniques to fine tune the segmentation of customer needs and wants and the possibility of combining marketing with mass production techniques. Such '*Mass Customization*' techniques were used in Japan in the 1980's – also by international Danish companies operating in Japan (Kristensen 1993). Later the Americans focused on combining this technique with Computer Aided Manufacturing in automated industrial production to benefit from relatively lower prices.

5.3.1 The features of the seller driven marketing model

In the seller driven model it is characteristic that:

The **buyer** is only a customer – no more. His primary obligation is to choose, which product he wants, and to pay for the product.

The **producers** frequently are also 'the sellers' and they have a marketing relationship with the customer based on specialisation, and they segment the market to meet special needs of selected target markets. In the building industry, it would imply that the producer should aim at more production at the factory and less on the construction site in order to be able to industrialize the production and utilize e.g. CAD-CAM technology. The producers would also use an increasing number of prefabricated components. The big producers would probably employ their own design teams and professional management.

The Consultants (if they have an independent role) have a marketing relationship with the customer to determine customer needs and wants and also carry out management functions (employ all relevant specialist categories) of the business enterprise.

The role and situation for the consultants vary in different industries within the Seller Driven Marketing Model and to illustrate this, a comparison of the model that is common for physicians with that of architects in the building industry is provided.

Leonardo da Vinci's dissection of dead bodies was a turning point for the physicians as a profession, and they were the first profession to implement the transformation from the old 'experience and art' based practice and its attached thinking - to a science-based practice, described in 'The Birth of the Clinic' (Foucault 1963). Most other professions have followed that path, but not the

architects, who seem to reject any attempt of secession from the old art-based culture.

In the health care sector the physician has been retained as the patient's independent advisor and has thus limited the role of the pharmaceutical industry. The diagnosis is made by the physician (finds out customer needs), and university hospitals carry out research and develop new medicine in cooperation with the industry. The physician knows the effect of the various pharmaceutical products, their pros and cons and chooses on that background. With the government as dominating customer, the physician managed to retain his authority as an independent adviser (pharmaceutical companies could easily develop a selling function, diagnose, and sell drugs directly to patients etc).

5.4 Barriers for transformation

The buyer controlled procurement model is of course not a law of nature. However, for a **public client** (government, municipalities etc.) the present EU regulation and Danish law constitute a barrier to change; a public client is obliged to use the old buyer controlled procurement model but a **private client** will be free to experiment.

For a private client the primary challenge will be the considerable capital investment in industrialised production facilities and to overcome the market resistance to new prefabrication and industrialised production. Also the culture that surrounds the building industry and romanticises 'craft' production is rather strong.

For private developers and catalogue house sellers, the idea of the seller driven procurement model is not alien. They have tried for years to emulate the customer approach of the seller driven model; only they have not skipped over the old building process and have not industrialised the production activity. For that reason their prices do not reflect any 'industrialisation and mass production gains'. (Until the developers etc. dare to abandon the old building process and instead industrialize the production, they are to be regarded as ordinary clients).

Does the market mechanism function in the building industry?
Yes, absolutely, but it is a mechanism in an environment without productivity growth, and it is important to understand that it is not competition like in the seller-driven industries; it applies to the entire business environment in the building industry.

The buyer-driven business model is characterized by the market mechanism and the regulation of competition in the *pre industrial period*, where it was customary that the buyer commissioned and specified goods for future production and delivery. In the pre-industrial business environment this was the usual way to acquire larger goods, and there were no alternatives.
On the other hand it is also true that competition in such an environment is not effective, particularly if the benchmark is that of most contemporary industries.

Bearing in mind that today the client rarely is capable of playing his role as expected, that the old building process and its business model has peaked long ago and largely is incompatible with the dominating norms and roles of society, it is increasingly difficult to defend the maintenance of the old buyer controlled procurement model, but surprisingly objections against the model are not often heard.

5.4.1 Interdependence?

The variables are special to either the Buyer Controlled Procurement Model or the Seller Driven Marketing Model as shown in table 3. Therefore, there are systemic barriers for a transformation process of the building industry, because of the interdependence of the variables. The benefits of a given model, prerequisites the transformation of *all* the variables; it is not possible to change one variable without changing the others.

Table 3. Interdependent variables in the two Procurement models.

Interdependent variables:	**BCPM**	**SDMM**
Buyer perception:	The buyer is a **Client**	The buyer is a **Customer**
Production mode:	Pre-Industrial **craft based production** supplemented with prefabricated objects.	Industrialised, unified production and leadership.
Leadership and management :	Formally the responsibility of the **Client**.	Taken care of by the Producer / **seller**

Try to change one variable to the other model – it is logically impossible.

5.5 Sub conclusion – Acquisition model

The seller driven procurement model has succeeded today in nearly all industries, because it *developed* the industry, and the products of the industry. It caused the shift from 'buyer' to 'customer' and its attached marketing management systems, particularly the leadership and management systems that were necessary to complete the transformation from the pre-industrial to the industrialised industry as will be shown in the following.

Any change will, by nature result in an existing 'something' being lost and other new things being gained. This is the typical consequence of new technology and new production processes. The shift from the buyer controlled to the seller driven marketing model involves a process where craft production is being phased out (this primarily would apply to new standardized projects, whereas the craft production will survive longest in the 'culture' segment's unique buildings).

Gutenberg's letterpress replaced the old handwritten manuscripts on parchment and it happened surprisingly quickly. Of course, something was lost. Many of the scriveners, who became redundant, were true artists, but more was won. Printed books were widespread, because they became more affordable, and that brought along an explosion of knowledge that has lead to the society we have today. In our time Gutenberg's letterpress was replaced by PC soft-ware and typographers became redundant. Again something was lost, but more was won. When the old building process is being replaced by industrial production etc., of course the old building culture and craftsman traditions gradually will be lost, but it is all about that more is gained...

6. Buyer Perception

The expression »buyer perception« refers to how the buyer is regarded, what his role and obligations are. Is the buyer a client[8] with leadership obligations? Or is the buyer a customer, whose only obligation is to pay the agreed price?

6.1 The buyer perception in industrialised industries

In most industrialised industries the buyer is a customer, who is expected to choose between different products and suppliers and furthermore is expected to consume the bought goods or services. The customer's only obligation is to pay for the product and to receive it as agreed.

The example in section 2.2.2 (the contrast to purchasing an automobile) illustrates the easy life of the customer; as long as the seller fulfils his obligations. Because the customer is not involved in the production process and is not expected to posses any technical knowledge of the product, the legislation in industrialised countries, e.g. EU countries, typically regulates the buying process by law.

In the industrialisation's mass production era, the Americans summed up the simple relation between producer and customer in this slogan: "We make, you take" (Xavier 1999). In the later and present phase the satisfaction of individual needs and interaction with the customer has become important, not the least concerning long lasting consumer goods and important investments like buying a home.

[8] www.etymonline.com: "Client" derives from Latin *clientem* (nom. *cliens*) "follower, retainer". The ground sense is of one who leans on another for protection. In ancient Rome, a plebeian under protection of a patrician (in this relationship called patronus, see patron); originally in English "a lawyer's customer," by c.1600 extended to any customer.

6.2 The 'Customer' experience in the building industry

When an inexperienced buyer, who is not familiar with the building industry in advance, reflects on his first experience as a client in the building industry, he is not unlikely to notice that the budget and time table are exceeded, and that he is left with a number of quality problems. He probably found his encounter with the construction industry a surprisingly uncontrollable experience and is left with the impression of an industry that is special, compared to other major industries and wonder whether there is a good objective reason for the construction industry to remain so special, instead of adapting to society like other industries have done? The client may have observed that:
He does not purchase a product, covered by the normal legal provisions, regulating purchase, but a building, covered by a special, non statutory, contract regulation, which requires the customer to act as the leader of the building project, which only few clients are able to[9].

As a client, he is involved in an old procurement model that presupposes that a building project should have 3 player categories: Client, consultants and contractors, and a peculiar relationship between them. The model is supposed to bring about *fair competition*, which is encapsulated in a form that was modern and up to date back in the Renaissance period: The buyer-controlled procurement. The work, that is bought, is still organized in projects in an old production model, rooted in the pre-industrial craft era, as the construction industry has had incredible difficulties to break away from. Even in spite of the numerous problems, 'the peculiarities' have been brought along.

6.2.1 The patron-client relation

The relation between the buyer in the building industry on the one hand and the architect and contractors on the other has since ancient Greece and Rome been encapsulated in the 'patron-client relation', which according to Gyldendal (2006) is a mutually obligatory arrangement between an individual, who has authority, social status, wealth, or some other personal resource (the patron) and another person who benefits from his or her support or influence (the client). (The relationship is perhaps more obvious in the system of servitude

[9] From 2010, a new Danish Regulation was agreed, applicable for small building projects, ('AB Forbruger' - ~General conditions for consumer Clients), that places small consumer clients more like ordinary customers.

known as serfdom that was widespread in Europe in the middle ages). The patron provided work, e.g. an assignment to the architect and from the renaissance period sometimes acted as a Maecenas[10] for the architect, who made a living and maybe got the opportunity to pursue his ambitions.

In the **Danish language** today, the 'buyer' is still the patron, bearing the name 'bygherre'. This is a medieval / feudal expression, meaning 'lord' of the building process. As the patron, he ('bygherren') is the formal leader of the building process, the employer, who is responsible for economy and security, for meeting the requirements in the building laws etc. However, in most projects the patron ('bygherren') is not capable of acting as the leader of the building process and therefore hires help – typically consultants such as architects, engineers etc. and in this way becomes somewhat dependent on their knowledge and experience.

The concept of the commissioning patron or principal ('bygherre') is grown out of the economic relations in the pre-industrial period. 'Bygherren' had the same relation to building workers etc., as the landlord had to his tenants and furthermore the concept of the commissioning principal belongs together with the Buyer Controlled Procurement Model.

The Danish kings maintained a long tradition for taking a personal interest in the design and building of public buildings, cities etc. Very often they personally acted as the principal in their building projects. To assist in these matters, by educating architects, the Royal Danish Academy of Fine Arts was established by king Frederik V in 1755. Still in my student days in the early 1970s, the diploma was given and handed over personally by the king.

In the **English context** however, the patron-client relationship has apparently been reversed. The architect becomes the 'patron' and on the other hand, the principal - who commissions and pays the architect to design and erect the building - becomes the 'client'. But in reality the client is the employer, who has to approve the work of the architect, every step of the way and can dismiss the architect after each stage, if he so pleases, while the architect typically needs

[10] Patron of art and literature.

the permission of the client to release himself from the contract, cf. the JCT series of standard contracts and the Phase Model.
(This reversion only makes sense, if the client is the weaker part, e.g. if he depends on the knowledge and advice from the professional architect, whom he has to pay. The architect provides advice and security (that the house is safe, in accordance to the law, with aesthetic qualities etc.) to the client, who pays for the service provided).

Several professions have maintained this olden relation between the client and the professional, e.g. dentists, physicians, solicitors, consultants, architects etc. Very often the relation between the client and the professional is regulated by a power of attorney, thus the professional can act on behalf of the client.

Other Danish professionals (physicians, dentists etc.) use the term 'client', like in English – almost synonymous with the term 'customer'. So again, we have a special situation in the building industry, where 'bygherre' is far from being synonymous with 'customer'.

Within the building industry, however the relations between the parties in Denmark and GB are similar. The Danish term 'bygherre', largely has the same meaning as the English term Client in the building industry – with the same legal implications - as illustrated in the following section.

6.3 An example – The Opera House in Copenhagen

To illustrate, that this old patron-client relationship still exists, the relationship and discourse between a famous Danish architect, Professor, Henning Larsen (and his office, HLT) and an equally famous client, Mærsk M. Møller (principal, owner of APM, the biggest shipping company in the world, with global harbour terminals, oil industry, retail trade, etc.) is reviewed. Around 2000 he decided that he would donate an Opera House to the Danish people and it was to be situated across from the royal palace, on the other side of the old harbour in Copenhagen. In this way it would complete the unfinished 'axe' of the rococo palace. The opera was designed and built in only 4 years.

The two men (both were in their 80s) knew each other from several previous building projects; e.g. from Mærsk's donation to Cambridge University of 'Churchill College'. But in the case of the opera house, 'everything went wrong'.

The client had organised his own team to manage and control the budget and 'everything else'. He interfered in the work of the architect and with reference to the legal contract, forced the architect to accept a design that he disliked and instead build according to the wishes and guidelines of the client. Legally the client was on firm ground; and the client treated the architect as a simple servant, somewhat like Mozart was treated by the Archbishop of Salzburg, who refused to accept Mozart's termination of employment (Sørensen 1991) in the second half of the 18th century.

To explain what happened, Larsen wrote a book about his experiences (Larsen 2009). This book is interesting, because it enlightens the power relations between the client and the architect, the old patron-client relation in a contemporary context. It is exceptional that the architect breaks his silence clause and unveils what actually occurred in the relationship between the two parties, typically characterized by deep secrecy. Of course, it must be remembered that we only hear one side of the story. *(Citations etc. from the book in Author's translation).*

According to Larsen (2009 p. 11), the client always has the final say - even in architectural matters[11].

> "The climate was very uncomfortable and in no way influenced by the spirit of cooperation or willingness among people who should share the same aim, namely a unique opera" (Larsen 2009 p. 18).

The client's own meeting minutes of 2. October 2002 shows the mistrust...

> "It is untenable that we do not have a finished project. Everything still seems so open, that it can be discussed and this is wrong ... HLT undertook the Opera House assignment 15 months ago - now they really must finish the project. They appear to delay various things, for example the design of the stage tower[12]: it is unnecessary and untenable...
> Things often come so late that we lose the desired influence; maybe things are delayed in order for HLT to better get their ideas through ...
> You gentlemen (APM staff) must consider, how we get HLT to understand their task" (Larsen 2009 p. 20).

[11] Of course this depends of the individual contract, but it is typical for the standard contract.
[12] The architect wanted to reduce the height of the visible tower by 3 m, but the client refused (Larsen, 2009, p.79).

The architect had designed an open glass façade towards the harbour and the royal palace in harmony with the idea of the building, but the client apparently wanted a rather closed façade, and when the architect refused to have his name attached to the client's façade choice, the client replied that the architect was liable under the contract (Larsen 2009 p. 25).

During a meeting between HLT and APM held on 11. October 2002, the client made it clear to the architect:

> "We have gone further than we intended! This is pressure! It is not acceptable! It is outrageous! I have obliged you! Your client cannot take anymore!"
> Finally he pointed furiously at the architect and shouted: "You must say Thank You"! (Larsen 2009 p. 28).

After this, Larsen wrote to the client that he immediately stepped down as the principal architect on the opera project, but that his office would fulfil the contract. The client's immediate response was that he would regard this as a breach of contract and the architect and his firm would be held responsible for client losses, due to this breach (Larsen 2009 pp. 32-34).

> "So, I was forced to comply with the dictatorial decisions, taken by Mr. Møller and his Foundation, i.e. people with knowledge in shipping, oil, economics and law, but not in architecture. They thought and made decisions as business men, from deadlines, economics and percentage calculations." (Larsen 2009 p. 37).

In a written note to Mr. Møller the architect wrote:

> "If you force through your ideas about the opera façade, you get your will: you get *your* Opera. But thereby you destroy *my* Opera, my architectural vision of perfection.
> And simultaneously you destroy Copenhagen's - yes, Denmark's Opera, which could and should have been at an international level ...
> The two of us will probably never speak together after this." (Larsen 2009 p. 41).

(Here the architect's idealistic naivety is disclosed as well as his romantic perception of the obsolete conditions in the building industry. The architect apparently lived in the delusion that he had artistic freedom to create a unique work of art, because he was promised all the money he asked for. But he must disillusioned recognize that he is subject to conditions which reduces him to the client's servant and that his only means of power is to threaten never to speak to the client again!)

The relation between the artist and the client…

The architect is aiming at creating a 'work of art' and sees himself as the great divine master, creating world architecture - while the client sees himself as the principal, who in his own right is creating an opera house to his own liking with the help of a famous architect, just like the kings did in the old days. Only he finds it troublesome, because the architect acts as an uncontrollable artist.

According to Larsen (2009), Mr. Møller probably wanted to please the Queen by improving the view from her palace (replacing old navy buildings with an Opera). In return he most likely expected to receive the highest Danish order, which normally is given exclusively to kings and queens from other countries. He did receive the decoration.

The working process of the architect…
"Mr. Møller did not understand the architect's working process. He did not understand the artistic, creative process. The fact, that he demanded that all ideas should have been tried before – preferably something he could see somewhere in the world, blocked innovation, fantasy and creativity, and all unique and groundbreaking ideas and experiments." (Larsen 2009 p.51).

According to Larsen (2009 pp.56-57), the client only had eye for less important details and totally lacked interest in the overall architectural design. Nothing was too small to interest him, he wanted to be the person, who took the final decision on everything... e.g. he had made a mock-up in 1:1 of the toilets, so they could be tested and finally they were installed at a height suitable for very tall persons, like himself.

In connection with the opening of the Opera, Danish television made a thematic program about the donation and the erection of the building. The architect was asked, if he during the process had wanted to leave the assignment, as a consequence of the attitude from the client, and Larsen answered, "Yes", but unfortunately was unable to do so, because of the contract that obliged him to finish the edifice.

In the opening ceremony, the client did not mention the architect as part of the creation process of the building; neither did the prime minister (Larsen 2009 pp. 135-140).

In a comment in a Danish newspaper (Felding 2009 [online]), the rector of the Architect School of the Royal Danish Academy of Fine Arts, taunts Mr. Larsen:

> "It definitely is not the client's ordinary right to snout an architect, as shown here. In general the parties discuss problems, and if they cannot agree, the parties must split. Typically, the architect withdraws himself from the building project."
> "I absolutely do not find it becoming that Henning Larsen implements the project and then renounces his responsibility once again afterwards."

Felding is also quoted for having used the word 'unbecoming' about Larsen's deliberate breach of confidentiality, which he was subject to, in connection with the construction of the opera - a secrecy which is generally used in connection with major construction projects.

The rector probably expresses the general attitude among architects: The Client is the principal and his words are 'law'; and the architect must respect this. If he cannot bring himself to that, the architect should add himself away in shame!

But the rector should have defended the architect's artistic freedom - otherwise highly praised by the Architect School. Instead he reduces himself to defend legal principles, whose ultimate consequences are that they eliminate the very idea of art and favours the attitude that architects should willingly subject themselves to a pre-industrial mindset and power relation, caused by a pre-industrial procurement model, and an obsolete relation between client and architect that precisely resembles the original pre-industrial characteristics of the patron-client relation.

But above all, it shows that the illusion of the architect as a free artist does not exist in the real world, again as a consequence of the role of the client and the associated buyer controlled procurement model. Therefore, there is not much to lose by a transformation to a new seller driven, industrial procurement model.

6.4 Barriers for transformation

Nothing prevents a private contractor or consultant for that matter to skip the concept of having a client and instead focus on the future users, the 'customers' and their needs. But again a systemic transformation is necessary to ensure the benefits of a transformational process.

Private developers and catalogue house sellers have tried to regard their buyers as 'customers', but in fact the developer, catalogue house seller etc. simply take on the role of the client themselves and thus continue the old building process almost unchanged. The only change is that their 'customers' are not the first, but the second buyers of the buildings and thereby escape the inconveniences of the traditional procurement process during production. The important production mode and business model are unchanged, meaning they have not industrialised the production and are not able to offer prices that reflect the 'industrialisation and mass production gains'.

Once the client concept really is disregarded, the procurement model changes to the seller driven marketing model, which implies that the producer and the seller in principle is one and the same. This again implies that the leadership and management of the production process, which used to reside at the client, and by definition does not concern the 'customer', now is the seller's responsibility.

Furthermore, the cultural barriers should not be underestimated. When you have completed the special training in the construction industry and have learned to understand industry-specific rules, it is difficult to say: Look, we need to move in an entirely different direction; what we are doing now is wrong! Once you are in, it is difficult to find your way out.

A single company or person has difficulty to foresee the consequences of a system change, which also means that you get everyone on the neck.

Especially the architects have found it easy to turn a blind eye to the shortcomings of the industry and any problems that are not aesthetical. A search in the curriculum of the architect education will disclose that the education is centred on the first sketch phases in the phase model: Concept, programme, and project and does not include any management subjects. Problems related to low productivity, high prices, build-ability of the preferred

design, management of the process etc. have a very low priority in the education of architects and maybe therefore also in their practice. As a lecturer at the architects' training courses for graduates, it was difficult not to notice that economic, legal and management disciplines were 'white spots on the map'.

6.4.1 Interdependence?

Therefore, there are interdependence between the variables and systemic barriers for a transformational process of the building industry: If you change one variable you have to replace the whole system to obtain the full effect of the new building industry model.

Table 4. Interdependence between the variables in regard to buyer perception

Interdependent variables:	**Client**	**Customer**
Procurement:	Buyer controlled	Seller driven
Production mode:	Pre-Industrial craft based production supplemented with prefabricated objects.	Industrialised, unified production and leadership.
Leadership and management :	Formally the responsibility of the Client.	Taken care of by the Producer / seller

When e.g. the shoemakers were out-competed by industrialised shoe-factories, the whole system was transformed. Once the 'customer' concept is applied, the Buyer controlled procurement model, where a client is leading the production, is contrary to the definition of the customer concept, and therefore not used. The interdependence of the respective variables leads to a process that involves a systemic transformation.

6.5 Sub conclusion – Buyer perception

Altogether the Opera House example illustrates that the 'buyer' perception is not the same in the building industry as in industrialised and seller driven industries. The old patron-client relation clearly originates from a pre industrial era and illustrates power relations that are destructive for a creative profession and for product development. The client is formally integrated in the building process in which he is assigned leadership obligations, and when he actually takes on this leadership responsibility and exploits it fully, it is characteristically

at the expense of the artistic freedom of the architect and the architectural quality. It is one of the systemic dysfunctions becoming apparent.

The concept of the Customer and the attached practice belong to the industrial seller driven marketing model, which assigns a much easier role to the buyer, a function without leadership responsibilities and without the obligation to participate in the production process.

Thus, there is a progression from the role of a client, as the *active* purchaser who is the initiator, and a prerequisite for the project to a completely different version of the buyer as a *passive* customer. The customers become the vital problem field in the seller driven marketing model, because the seller now has to find the customers, whereas before the client found the 'seller'.

7. Production mode

Having determined to transform the procurement model, and buyer perception, it is time to examine how to change from projects to routine operation in this imagined, new building industry model.

Since the breakthrough of the agricultural society, 'production' has been organized, respectively as the daily routine operations, and as those special single tasks that were necessary in addition to the routine production; or as stated by PMI (2004): "Generally, work can be categorized as either projects or operations, although the two sometimes overlap". Comprehended in this way production equals: Routine operations *plus* projects.

'To build' is frequently included in the list of typical examples of projects. This is true, but only with the addition: It is another kind of project; it is the old original one.

Even though buildings always have been necessary for the routine operations, and as a reproductive need to maintain the work force, the construction of those buildings have traditionally been considered an additional special task from the point of view of the routine operation which provided the revenue that paid for the building. Therefore, building activities were organized as a project, and seen as costs.

For the purpose of this study, the focus is on the contrast between routine operation and the project and thereby on the differences of the underlying activities in space and time as exemplified in table 5.

Table 5: The typical industrial *project* in comparison with *routine operation:*

	Project characteristics	**Routine operation characteristics**
Definition	*Temporary* endeavour undertaken to create a *unique* product, service or result.	The daily business activities that are defined and run by the leadership and management of the business enterprise.
Duration	Temporary - known start and end date.	'Forever' ongoing, repetitive activities.
Activities	Planned, executed and controlled.	Planned, executed and controlled.
Objective	Attain objective and terminate.	Sustain the business.

Source: PMI, A guide to the project management body of knowledge, 3rd edition, 2004, PA, USA

In the post World War II industrial era, organization and management systems in most businesses were based on work division and specialization, typically resulting in a function-based organization according to Junge-Jensen (1980):

> "The project organization was first known in connection with the U.S. space program, which began in the late fifties. It arose as a demand from the space administration to the private companies who were suppliers of rockets and equipment. The government wanted a project organization, because this provided the opportunity to negotiate with one individual, the project manager who was responsible to comply with costs and deadlines...
> A project can be defined as a single task with the following characteristics:
> -it has a more or less uniquely defined object
> -it is time-delimited
> -it has a non-routine character
> -it is complex because it requires the effort from several kinds of specialists.
>
> Such a task is difficult to solve in a traditional organization with a function-based specialization. The individual departments here will not be primarily concerned with the project as a whole but only of their functional contribution to the project. Instead, a temporary organization to manage the project can be created...
> The reaction from the mentioned U.S. companies that were faced with the government demands, was to establish a so-called matrix organization, as a mixture between a pure function-based and a pure project organization. The matrix organization becomes an extension of the existing basic organization ..." (Author's translation).

In this context it becomes evident that the old project concept that has existed in the building industry for centuries, both resembles and markedly differs from the above described matrix organization. Therefore, in this thesis the project concept is defined as:

> *Temporary, professional activities that constitute a business task, which requires its own organizational framework* that in the context of an **industrial mode of production** is different from and a supplement to the normal daily routine operations of the business enterprise. Here the project solves the single tasks that do not fit with the industrial routine production. In short, it is named $P_{(ind)}$.
>
> In the context of a craft based, **pre-industrial mode of production**, a project is perceived as *temporary, professional activities that make up a single business assignment, which requires its own organizational framework* – albeit here the project is not a supplement to any parallel daily routine operation of an enterprise. In short, $P_{(pre\text{-}ind)}$.

In the building industry $P_{(pre\text{-}ind)}$ is simply a standalone assignment, organized around the Client, his needs and leadership. In the building industry, projects *are* the everyday production. This will be developed further.

(This way of regarding the project concept does not necessarily preclude the application of other project definitions or indicate that other definitions are less operational in relation to the purposes they might apply to).

7.1 The Project Concept, $P_{(ind)}$ in industrialised industries

When the project and the routine operations are compared, see table 5 above, it is evident that they are not the same, apart from 'coincidental activities' that might resemble each other (PMI 2004). The two simply have different objectives and duration:

So, what primarily describes a project in the industrialised context is that it represents an isolated activity, something you only do once - in contrast to the daily routine's *repetitive* activity, which characterizes the industrial mode of production (series and mass production). Similarly, projects typically use a different kind of leadership than the routine operation (Junge-Jensen 1980), which particularly focuses on how to meet the company objectives, while the project naturally focuses on project objectives.

In 1976 the matrix organization had spread to half of the Danish industrialised companies (Junge-Jensen 1980) that used such project groups when they had recognized a special need, which the primary company organization and management systems were not fit to satisfy: Every organisation will from time to time be confronted with challenges or tasks that differ from those of the daily routine operations. Such *non-routine* activities might be development tasks, acquisitions, and major investments (PMI 2004). These are special, *temporary* activities, which preferably should be isolated from the daily operations, because they are difficult to deal with, within the organisation's normal operational limits.

As a means of organising these activities, a 'new concept' of a *project* was adapted. To run these projects, a corresponding special organization structure: *a matrix organisation / or project group* and an attached management system:

project management was generated (Junge-Jensen 1980); it was not expedient and profitable to set up the industrial process to solve or industrially produce these singular tasks.
The *purpose of the projects* is either to become future routine operations themselves or to turn into support functions for the routine operation.

$P_{(ind)}$ is, in essence, a concept that encapsulates the industrialised industry's answer to the question: How do we best organize *special, temporary* tasks in an optimal way, so they do not get distorted by the normal standard production and on the other hand, so that the standard operation environment does not get disturbed or affected by the project?

By isolating special tasks in projects and thus creating a distance to normal daily operation, the projects risk living a life of their own, not being adjusted to the company's vision and strategy, where the project hopefully should fit in. To prevent this risk from occurring, the primary leadership and management system of the company has an important role to play (Junge-Jensen 1980).

This is why projects and project management in the industrial world cannot stand alone without the primary leadership and management of the company defining objectives of the project, evaluating the results and providing feed-back in between.

Gradually this new concept became the industry standard for $P_{(ind)}$ in the industrialised sectors (Junge-Jensen 1980) – but not in the building industry that continued its old project culture, $P_{(pre\text{-}ind)}$.

7.1.1 Projects are in their nature pre-industrial

Even though the matrix organization is from the industrial period, the very idea of projects is pre-industrial and probably derives from the building industry. **Projects** focus on the project objective(s), and are initiated with a high degree of abstraction. First comes the assembling of the project group of specialists, and this project team works 'top-down', while ideas are developed and prepared for implementation, just like in the building industry.

Based on my experience, it is a deductive process that interacts with inductive corrections. Reversely, industrial, **routine production** is in its basis

an inductive process. Production managers work from single elements to the finished entirety.

The routine operations are usually the core activity in the industrialised production process, which also creates the revenue here and now, and usually the routine operations are connected to the seller driven marketing model. But also in the industrialised context, projects are often used together with the old buyer driven procurement model; because there is no pre-developed marketplace for those temporary special tasks. An example of this could be unique computer applications that are focused on solving special purposes. A project group using project management simply responds better to the needs and problems of single, special activities. However, they are used in a version that is adapted to their function as a supplementary activity. If the business does not have the resources to tackle the project internally, the old buyer driven procurement model (a tender) might represent a solution to that problem.

7.2 The Project Concept, $P_{(pre\text{-}ind)}$ in the Building Industry

The concept of a 'project' originates from the old building tradition and the word 'project' derives from Latin *'projectum'*, meaning a draft outline, a drawn plan (Gyldendal 2006). To project is to 'throw forward' ones ideas by giving them a physical form and by estimating the building organisation and its use of resources, the procurement route etc. Before actually building, it would be necessary to present these ideas to others and for that purpose, it would be helpful to transform the ideas into a 'project'. (Vesely 2006) puts it this way:

> "Each project, however small or unimportant, begins with a program – or at least with a vision of the anticipated result. Such a program or vision is formed in the space of experience and knowledge available to each of us. The result can be seen as the single actualization of an infinite number of possibilities. The formation of the program can be modified or improved through words or drawings because they make the potential field of possibilities present and available".

Other production factors, which also originally were regarded as additional special production tasks, e.g. the production of machinery, have been transformed into routine production by changing production mode and by changing procurement model; from the old buyer driven to the new seller

driven procurement model. The production of the first letterpress machine for example, must logically have been regarded as a special task, but later it became routine production. The same transformational process is what the building materials industry also has implemented in the post World War II period.

However, the building industry has maintained its role as producing *special single tasks*, and it maintained its buyer-driven procurement model, which altogether meant that these special single tasks were organised as projects. In the building industry, projects have been an integrated part of the old building culture for so long that people probably have ceased to think about why building assignments are organized as projects, and do not consider what the alternative could be.

7.2.1 $P_{(pre\text{-}ind)}$ in the building industry is not the same as $P_{(ind)}$

The fundamental **differences** between the industrial and pre-industrial project concepts have to do with the character of the production, the procurement model, and the manifestation of leadership: $P_{(pre\text{-}ind)}$ in the building industry is organized around the client, as a consequence of the buyer controlled procurement model, and $P_{(pre\text{-}ind)}$ is not a supplement to the daily routine operation of the business enterprises in the building industry; it is more like a standalone assignment, and it does not take place in the context of a business enterprise's leadership and management environment, like in the industrialised industries. Furthermore, most development tasks are typically included in every building project, which also includes the production of the building, whereas development tasks typically are isolated as supplementary, single projects in industrialised industries.

Table 6: Differences between industrialised industries and the building industry

	Industrialised industries	The building industry
BCPM:	Projects are used for e.g. special development purposes, as supplement to the routine operation of the same company.	A project is only a supplement to the routine operation from the point of view of the client. But for the 'producers' / the enterprises in the building industry, all they do are projects and the projects are not a supplement to any routine production from their point of view.
SDMM:	A project is a *supplement* to the routine operation of the same company.	'To build' turns into *routine operation*, for the enterprises in the building industry, if the seller driven model is applied.

This brings us back to, what the original question was, that projects were an answer to in the building industry and at the architect firm? The following is suggested: How can the **client** organize and manage his building assignment in the best way, with respect to his budget and deadline?

In this context, **a project becomes a standalone assignment,** organized around the Client, his needs and leadership.

The project concept in the building industry includes how the client with help from consultants:

- Creates the ideas and the design from scratch, develop 'product' solutions before or during the erection of the building,
- Organizes the practical construction and 'production' of the building,
- Procures the resources that are needed,
- Leads the building process.

Are projects still the best answer to that question – or will routine production together with the seller driven marketing model do a better job for the customers? (In regard to product development, higher quality, and lower prices on homes, without envisaging an 'Ikea flat-pack' approach to 'procurement' and marketing of housing).

Sceptics criticize that typically every building is unique and produced in one copy only, since the first wave of industrialisation in the 1960s, and by a new team of consultants and contractors (Østergaard 1999 p. 23). This does not promote the sharing of knowledge and experience based learning from bad solutions and defects. The project organisation itself (assembling new project groups for each assignment) used in the building industry is seen as a negative factor, preventing innovation and change. No or little reuse of solutions (Østergaard 1999 p.25) – no real 'object orientation'.

Organising the building process as projects implies that the consultants, contractors and all the other parties involved in the building process 'create' risk through changing cooperation partners for every new project; and for this reason they practically have to start from scratch in every new project, depending on the client's choice of consultants and contractors. The constantly changing project groups are a consequence of the project approach and the procurement tradition (tenders), which in this way become a barrier to progressing the building industry towards a more industrialised production

mode etc., cf. (Kristiansen, Storgaard and Egebjerg 2006) in the report 'Strategic Partnerships in the Building Industry'.

In project groups with constantly changing participants, the tendency is that the evaluation phase (after termination) typically is 'forgotten', because the participants rush on to the next project (Østergaard 1999 p. 23). Therefore they have a slow learning process from errors, bad cooperation etc. Again this is presumably a consequence of the client's leadership. When the project terminates, his interest in the parties' cooperation feed-back comes to an end, because the client might not build another building for the next many years and no other party has an incentive to follow up on this.

7.2.2 Gains from industrializing the building process

The latest attempt towards industrialisation of the Danish building industry was prepared around 2000 by the then government, supported by both the contractors and consultants in order to try to seriously cut construction costs, reduce building time and the number of defects. The public authorities are the biggest client in Denmark and could make a major impact on the demand side:

> "Part of the reason for the relatively low level of industrialisation in the building industry is to be found on the demand side; it is often highly cyclical and fragmented. It promotes the production of single building projects, which are different each time with a new team of subcontractors. This framework provides poor conditions for reiteration processes and for innovation and learning" (Byggepolitisk Taskforce, 2000 p.157 in Author's translation).

As this government task force argues, it is necessary to industrialize production in the building industry if the productivity is to increase and it is underlined that it is a misconception that industrialised construction is synonymous with standardized and monotonous buildings, produced in large numbers. Contemporary industrial production systems also allow for production of individual quality buildings in smaller series of high architectural quality:

> "Increased use of industrial processes in the building industry should provide the individual consumer to choose between many different products at different prices. Industrialisation must provide alternatives to the 'one of a kind' production - but not replace it.
> Some clients will want - and be willing to pay for - the very special and unique edifice. Like handicraft - or a "Rolls Royce". Others would rather have a building based on standard components and / or processes. They can provide a nice, solid and varied building, but with less freedom than the

> ‘one of a kind’ solution. On the other hand it can be built cheaper” (Byggepolitisk Taskforce 2000 p. 159 in Author’s translation).

And the industrialisation gains are to be retrieved by streamlining the underlying production processes through planning, management and logistics inspired by other industries:

> “By moving some of the production to a more predictable and controlled environment in workshops or factories, rather than different building sites, it will be possible to manage and control the building process better. This in turn will boost quality and speed. Equally, it will also be possible to control other factors such as the work environment. Industrial production does not mean that there will be no errors. But the production can be controlled to reduce errors” (Byggepolitisk Taskforce 2000 p. 160 in Author’s translation).

According to Byggepolitisk Taskforce (2000), industrialisation of the building process includes the development of flexible building systems that can be industrially manufactured so they can be supplied in modular sections on site, enabling the process at the building site to be more efficient and reduced to assembly work whenever possible; plus the use of industrial leadership and management meaning the adaptation of the principles of production from other industries in terms of organization, leadership, accountability, innovation, quality control and customer relations.

Estimated 25-50% cost reduction

According to Madsen (2000) the opportunities for reducing costs in construction are estimated to about 25-50% of the construction costs, simply by repeating the same construction, reducing defects and thereby time, correcting errors in the finished buildings, reducing logistics errors and waiting time on site (may represent one third of the work hours) and by introducing more flexible work groups.

7.3 The organization of the production process

All the way back to when concepts such as ‘business enterprise’ or ‘firm’ were not in use in the building industry, neither verbally, nor mentally, the construction of buildings have been organized in projects, which embraced both the design and production of buildings. Likewise, it is typical for every building project that it has a principal, who is the buyer and formal leader of the project.

The old project concept must be understood in context with the different roles of the client and the business culture in which the parties operate.

The building project is a 'temporary enterprise'.

In Danish the word for a construction project is "byggeri". Linguistically this word is similar to the names of other craft based enterprises like "bryggeri" (brewery), "bageri" (bakery) etc. All are names of companies and trades, just like "byggeri", which denotes a client that temporarily establishes and leads an enterprise in order to erect a building.

As seen in 7.2.1 there are two different project concepts, mainly because of the different procurement models. But in regard to the production, there are also two different organizational frameworks, which are equally important.

The industrial business enterprise

In principle, in the **industrial** context, **a Business enterprise** implements a unified routine production process, supplemented with special tasks, organized as projects. The business enterprise operates independently on the market to satisfy customer needs, using the available industrial management tools.

The **industrial business enterprise** has its own organisational framework with its own primary leadership and management function around internal functions like production, economy, communication and personnel.
In the seller driven industries this concept was probably implemented to eliminate the shifting cooperation participants and the related problems that characterize the buyer controlled projects.

The pre-industrial context in the building industry

In the **pre-industrial** context and particularly in the building industry, production traditionally is organised as single assignments, around the client, his needs and leadership with shifting groups of participants. This means that several actors implement a divided production process.

Therefore the contemporary conception of a business enterprise is seldom found in the building industry, or at least not in its fully developed form, cf. for instance *D&B contractors, who even typically continue the old building process and use the buyer controlled procurement model to organize the production using several subcontractors etc., who vary from project to project*. This likewise applies to big business enterprises like e.g. Skanska and Norman

Foster Architects as long as they are subject to the old building process. They are not seller driven business enterprises yet.

7.3.1 The Business Enterprise in industrialised industries

The lesson that was to be learned from Gutenberg's innovation was that production and sales were each other's premises (Mørch 2009) and therefore it is interesting whether this experience-based lesson is reflected in the contemporary management-oriented business enterprise and its typical organization?

Kotler (2010), whose books on Marketing Management (versions 1-3) has influenced modern businesses during the last 35 years, states that a contemporary business organization typically includes a number of *internal functions* (marketing, finances, personnel, production), which are controlled by the enterprise itself; and of these functions **Marketing from about 1970 is recognised as the dominating function**, because it links the company with the customers. No customers, means no sale and consequently, no reason for the production, etc. From that time on "Marketing is Market Analysis, Planning, and Control" (Kotler 1980). Or as Xavier (1999) concludes:

> »Interestingly, it was during the Industrial Age that the term marketing was coined to signify the need identification and satisfaction process. This was necessitated due to the fact that the producers/sellers (large factories producing goods of uniform quality in large quantities) did not have a face-to-face interaction with the consumers.
> Consequently, producers of goods had problems matching customer needs with their manufacturing capabilities. Even with all the rhetoric about the customer being the king, the industrial era did use tools like manipulative advertising and high-power selling skills to exploit the gullible customer«.

Each business enterprise, like its competitors, has to adapt to the market environment (Kotler 1980), consisting of various systems (e.g. the laws of the society, the general economic demand in society, the technological level of development, and the cultural preferences in society), which it does not control. This of course can be conducted more or less professionally and more or less marketing-oriented.

In the long run leadership is about 'reading' the market environment plus knowing and adjusting the internal functions of the company to the conditions of the marketplace. This leadership / adaptation process might be *active* introducing new products and penetrating new markets or *passive* (milking

existing products and markets and cutting down afterwards) etc. (Kotler 1980 and 2010).

Therefore, it can be concluded that our contemporary business enterprise has developed into an organization, which through marketing management disciplines copes with the challenges of the interrelated production and sale.

This adaptation process is the core leadership activity, whatever the time horizon. (See also section 5.3 The Seller Driven Procurement model, SDMM).

Gutenberg did not live in vain; his seller driven procurement has prevailed today in nearly all industries. However, this does not mean that it is without risk to produce and market new products, or to produce in large quantities to unknown customers; also today some books cannot be sold, because there are no customers or they are not aware of the existence of the book etc.; but the benefits of this business model outweigh the disadvantages. This would most likely also apply to the building industry.

7.3.2 The Business Enterprise in the building industry

The old organizational model in the building industry left no room for developing *real business enterprises. It* has proven to be tenacious – a 'strait-jacket' for the development of the building industry.

The Interface between 'Project' and 'Business Enterprise' can be considered in terms of focal points. According to Mouritsen (2009) the project (and not the business enterprise) is the central focal point for the construction industry, because buildings are planned and carried out in projects and likewise, projects can be said to create the building sector; the money is spent on projects, which create all revenues.

As the outcome of a survey Mouritsen (2009) mentions that two archetypal firms can be sketched in today's Danish building industry (shortened, adapted, and translated by me):

A. Firms that are solely organized around their projects

- Focus solely on projects and the sum of the projects is equal to the identity of the firm.
- All leadership and management are contained within the projects.

- Time horizon: Short.

Advantages:

- Labour costs are variable and vary with the projects.
- Maximum flexibility in fulfilment of the assignment – minimum fixed costs.
- Part of a *generic* network, which makes it easy to hire and fire.
- The firm's experience is field oriented.
- The projects create dynamics and development.
- Small variance in economic results over time (because of small fixed costs in bad periods).

Disadvantages:

- When the projects seize to appear 'by themselves' in a declining market, the firm is reduced to 'nearly nothing' and its life is threatened.
- The firm is reluctant to invest in education of the employees, because they are likely to jump to a new project in another firm – meaning the investment would be lost.
- Only generic qualifications, competences etc.
- Must sell generic qualifications / 'hours', rather than ideas.
- Difficult to raise prices, when you sell the same as the others.

B. Business enterprises that are producing projects:

- Focus not only on projects but also on the business enterprise part of the firm.
- Have collected knowledge and technology that are unique to that particular enterprise and are not project specific.
- The firm exists besides the projects and the sum of the projects is less than the identity of the firm.
- Specialized and specific competences (a certain capacity, various competences that are specific to the business enterprise).
- The firm is aware of its competences and is able to use the knowledge in connection to pre-qualifications etc.
- Some leadership activities outside the projects with focus on the business enterprise, its market position and survival.
- Time horizon: Longer.

Advantages:

- The specific knowledge is used to generate projects and represents an advantage to the business enterprise in a declining market.
- Labour costs are both fixed and variable: Key members of the organization + project employees that vary with the projects.
- The business enterprise is part of a network that binds the participants to mutual cooperation.
- The business enterprise invests in new relations, employees, leadership and management, technology etc.
- Is able to sell ideas, principles, and organization models at a higher price.

Disadvantages:

- Less flexibility, but more continuity.
- In a declining market they have to cut down the 'business enterprise part'.
- Larger variance in economic results over time (because of larger fixed costs in bad periods).

The two archetypal firm-models apply to both consulting firms (probably the majority of firms that are solely organized around their projects) and contractors (probably the majority of business enterprises that are producing projects).

But as long as *firms, organized around their projects,* are believed more profitable than *companies producing projects*, it is difficult to find an incentive for the industry to develop towards the seller driven marketing model, *by themselves*. Together with the buyer driven procurement model itself, this may have hindered the development of real business enterprises and the building industry as such.

But today, the need of a greater focus on developing the 'business *enterprise' derives from 'the larger clients'*, who demand pre-qualifications, partnering, PPP etc., which forces both consultants and contractors to demonstrate their competences and management abilities previous to tender (before they have been granted a project). If they want an assignment, they have to satisfy the client's need of information about their 'business enterprise' on beforehand, which emphasize the importance of developing 'the business enterprise aspect' of their firm. Even though that need does not originate from themselves, the side effect might be helping them to develop.

More 'project' means less 'business enterprise'

Because the projects were initiated, commissioned and controlled by the client, who also had the leadership responsibilities, the need for developing real business enterprises for those who worked on the projects was very limited. My conclusion is that the client always has had a natural interest in his own project in contrast to developing strong 'business enterprises' for the groups of labourers in his projects, who consisted of various 'specialists' and craftsmen; often organized in extended families, travelling from project to project.

From the perspective of what, we today would call a business enterprise, and viewed over time, we would - in the Building industry - only be able to recognize the identity of a business enterprise as the mere sum of projects. Even today in the building industry, the 'business enterprise part' of the firm is typically the residual that remains – when the projects are subtracted. That residual is whatever 'management' there is. All too often this 'left over' is practically zero and does not resemble the contemporary modern 'business enterprise', which is able to produce for unknown customers. The usual functions that constitute a business enterprise are missing or only partly present, cf. section 7.3.1

The contrast between the contemporary, industrialised company and a firm in the building industry can be illustrated by comparing the capital requirements for creating jobs in the two sectors.

To set up a small business in the Danish building industry, it even today only takes an investment of a few £. A bricklayer needs a bucket, a few tools and a rented car; the same applies for a painter etc. In the industrialised industries however, the creation of jobs typically takes a capital investment of considerable sums. (As a rule of thumb, the creation of the first industrial job in small companies demands perhaps more than £1 million, and the additional jobs, each more than £100.000, because of the investment in production facilities, like factory buildings, machinery etc. – (my estimation)).

Also for the majority of the employees of the business enterprises in today's building industry, it has never been possible to obtain the same job conditions as in industrialised industries. The conditions of engagement have historically been dominated by *project hiring* for both building workers and architects, who

in this respect very often are seen as 'variable costs'. From the point of view of the employees, the job security today is not at the same level as in industrialised industries. From the point of view of the firm, this again does not create an incentive for developing a 'HR department' and the corresponding management system, which would provide the employees with further education and the enterprise with new competences.

7.3.3 The Evolution of Firms in the Building Industry

Basically, the labour force that is employed in the old building process still has to move on to a new project at a new location, when the current project is finished, even though this migration was much larger in the medieval period[13].

Seen in this perspective, the old building process, organised around the 'client's concept of a project', represents the precursor to a contemporary 'business enterprise' in the building industry and a replacement for the organizational framework that a modern business enterprise represents.
The preconditions - the existence of a local market where demand constantly is large enough - for setting up 'firms' (*from Latin 'firmus' ~fixed, settled)* with a fixed production location are typically not present in the building industry, as long as the work predominantly takes place at the building site and is organised around the client.

In market towns it was possible for craftsmen to set up their own fixed workshops that could produce some building elements to local building projects and repair work. An example of this is the joiner, who could manufacture the windows and doors for a new building in his workshop and transport them to the building site on a small cart. But craftsmen like masons, bricklayers and carpenters only used their 'workshops' to store and repair their tools and to prepare materials for the building process. They had (and still have) to work at the building site.

Guilds were organised in most market towns for most trades to control (limit) competition (Gyldendal 2006) by the use of tenders and regulate the business terms, the 'General Conditions' of the industry. The guilds also controlled the quality of the educational system (the apprentice, journeyman,

[13] Historians estimate that up to 30% of Europe's population in the medieval period was constantly moving around without a fixed residence. They earned their living from performing temporary jobs and services. (Henrik Tarp: Pilgrimsvejen til Santiago de Compostela, p.15. 2005. København)

master system). This system also ensured the generational change (Gyldendal 2006).

The business enterprises with fixed production facilities, which in the last decades have grown out of the building industry, are typically producing pre-fabricated building elements, components and sub assemblies. They are usually fully industrialised.

On the basis of the above, we can set up a model of the progression from the family and guild organized beginning towards a modern business enterprise in the building industry:

A. The **'Nomadic' stage.** Tangible firms do not exist, because the client organizes the building projects, using the 'Roman family model'. This stage probably only exists today in connection with complicated restoration work and major civil engineering projects like suspension bridges etc. According to Mørch (2009 p. 124):

> "The 'rushing journeymen', 'naverne' as they called themselves in Danish, were an integral part of the travelling public. Along with the pilgrims they constituted the vast majority of European travellers from the very darkest middle Ages - nobody knows from when - and until the First World War. It was largely through them that technology transfer took place in all the trades one can think of, even in something like the letterpress". (Author's translation).

B. The **Stationary firms** in market towns. However, the market and business functions are underdeveloped, tailored to the buyer controlled procurement model. The firms of most consultants and contractors belong in this category.

C. The **Specialized Firms,** producing projects, e.g. developers and larger contractors. Production, market and business functions are in their infancy. In this stage the firm must satisfy both the buyer driven (in regard to the building process) and the seller driven model (in regard to buyers of homes etc.).

D. The **Modern Business Enterprise**. Rarely found in the building industry, but common in the building materials industry, where a business enterprise can operate, either wholly as a seller driven enterprise, or is free to partly supplement with tender orders (organized as $P_{(ind)}$) in the context of building projects.

7.4 Barriers for transforming projects to routine operation?

The production of building materials was industrialised, while the building process on site never has been changed (Madsen 2000). The building materials industry managed to change to the seller driven marketing model, which permitted the development of independent business enterprises that were strong enough to decide their own strategy. Will the building industry be able to do the same?

Byggepolitisk Taskforce (2000 p. 162) summarizes the special barriers to innovation and industrialisation in the building industry, indicating both external causes (fluctuations of the market and single-project demand) and also internal barriers (in Author's translation):

> *The business enterprises in the building industry are very sensitive to fluctuations of the market, which causes them to limit risk taking and avoid investments that increases fixed costs. Instead they choose to be hyper flexible, meaning they do not specialize, or cooperate with other companies.*
>
> *Innovations in the building process are difficult to protect and the business enterprises are afraid that other parties will harvest the benefits gains and disappear as higher pay because of piecework agreements etc.*
>
> *The building industry consists of relatively small and fragmented businesses in which the low capital base is a barrier to investment in innovation.*
>
> *The business enterprises are marked by the lacking tradition for cooperation and leadership leading to very loose cooperation and leadership plus a relatively low loyalty feeling among employees caused by the widespread "fire and hire" practice in construction with frequent shifts in employment. It does not promote learning and innovation.*
>
> *The building projects are marked by their limited repetition effect, caused by the changing participants in the various projects, which again means that there is little motivation for investments in new products and processes in collaboration with other business enterprises.*
>
> *The production process is characterized by traditional craftsmanship with rigid trade boundaries and remuneration systems, which constitute a barrier to innovation.*
>
> *Simultaneously the business enterprises in the building industry do not exploit the new knowledge that is available to them.*

Thus, it has proven difficult, especially for consultants and contractors to implement an adequate innovation that could result in increased productivity.

The building material producers on the other hand have benefitted from the transformation to the seller driven marketing model that allows them to influence their customers directly by employing 'consultants' that 'help' clients and architects to choose their products.

7.4.1 A miss is as good as a mile …

The task force report and all the other reports about the building industry, published around 2000 came a long way down the road, but they were primarily dealing with 'product and process' and forgot the other half of the "interdependent production and sales". The product- and production-oriented mindset is typical of 'entrepreneurs'. That is what 'breaks their neck', because they typically are only interested in the product and its production and neglect the other and more important half, namely the marketing-oriented approach to the 'unknown' customers.

It is striking that the taskforce report does not mention the buyer controlled procurement model as a problem, or that the building industry never replaced the client with the customer, nor does it mention that the production and sale must be interrelated, if a transformational industrialisation is to make sense. Although many of the problems are described in the report, it still does not represent a coherent understanding of the basic problem complex. It is the lack of understanding of the problems as a cohesive whole that is missing in the analysis and the debate. This is a barrier to innovation and fundamental change of the structures that prevent the implementation of a transformational process.

The biggest single problem is the attempts to take shortcuts that probably do not exist; for example to:

- Force the use of IT, although a rational IT application requires industrial production and management and does not fit with the craft era context.
- Attempt to implement industrial management even though production is craft based and probably by nature incompatible with industrial management.
- Pretend the existence of 'customers' in the building industry even though they do not exist, and this represents pure escapism from the client and his role. For example this is evident, when it is proposed to use 'mass customization' techniques to satisfy the individual needs and wishes of

customers, although the building industry has neither customers, nor industrial production technology.

When all these things are said, it is notable that the Danish reports about the development in the Danish building industry (the desire for change), rarely origin from the building industry, but from *academic civil servants in e.g. the ministries, who compare the performance in the building industry with other contemporary industries*. In their analyses, they use the general norms that are valid in society; while the building industry uses the internal norms of the industry; and that leads to both different objectives and conclusions.

7.4.2 Systemic or practical barriers?

The necessary preconditions for transforming the production in the construction industry are present in society in regard to technology and management know-how. But it requires a rather large investment, and the risk may be evaluated as being significant, because sales of homes tend to move in cycles.

Is high or low profits a barrier for change in the building industry?

It would be a common assumption that a high return on capital in the building industry would not initiate a transformational process at least regarding the existing enterprises in the industry, and that a low profitability on the other hand might promote the desire to change. Why risk a lot of money if you are already satisfied with the profit, you make? But are the profits high or low in the building industry?

In the Danish context very high profits have been made in the redevelopment market, where old residential areas in the bigger cities have been altered from rented flats to condos; but in the market for *producing* new buildings and homes, the general opinion seems to be: "The building industry consists of relatively small and fragmented businesses… With a few exceptions, construction companies have been characterized by a weak capital base ..." (Byggepolitisk Taskforce 2000 p. 162). This implies that either profits are low or dividends high. But as shown in section 7.3 one thing is certain, the special conditions in the building industry enable the contractors to fire workers when the project is finished, because they are hired on a project basis. This enables contractors to sustain a more constant profit rate.

The British context deviates from the Danish background. The British economy is simply more 'capitalistic' and liberalistic, exemplified by the difference in income distribution (larger spread in UK), the perception of the role of the state and the size of the public sector (the public sector in Denmark is rather big and equally popular, because the population gets value for the tax payments).

In the British context Ball (1988 pp. 126-130) very convincingly argues that standard models of industrial restructuring are inapplicable in construction and shows how the industry cannot be subsumed under a simple, general theory of corporate behaviour. The 'profits paradox' would confound any conventional analysis according to Ball (1988 p. 126):

> "Conventional wisdom suggests that falls in output of the magnitude experienced in construction lead to forced rationalisation of the industry through a massive devalorisation of capital, and the centralisation of ownership of what remains".

But this did not happen and Ball (1988 p. 129) furthermore argues that rates of return in construction are consistently higher than in manufacturing:

> *"About profits performance of larger UK building firms (1961-81)*
> …A number of interesting points emerge from the data. The first, and perhaps most surprising … is that with the exception of one year, 1973, rates of return in construction are consistently higher than in manufacturing. Moreover, 1973 … were reeling under the impact of over-hasty property and land speculation.
> The second point to note is that construction profitability has a cyclical variation which is similar to that of manufacturing. During downturns the differential between the rates of profit narrows, whilst in the profits-upturns it widens again. The similarity of the cycle of construction profitability with the rest of the economy suggests that is the general state of the economy rather than the volume of aggregate demand for construction work that determines variations in profitability. The influence of the economy as a whole presumably operates through the effect on input costs, through the interest rates charged on loan finance, and possibly on building firms' tender-pricing strategies".

This supposed centralisation would in an industrial context take place through the formation of cartels, 'gentlemen's agreements' on pricing policy, plant closure and amalgamation. Alternatively, fierce price wars could break out as firms with large overheads and economies-of-scale-inducing fixed-capital strive to maintain or expand market shares. Gradually the weakest high-cost

producers would go down, leaving a more centralised and technically efficient industry. But as Ball (1988 p. 126) argues:

> "Whichever path is taken, the theory would suggest that there are reduced profits during the restructuring phase of the downswing, plus extensive company amalgamations or collapses and widespread plant closures. This model may apply in varying degrees to manufacturing industries… but it certainly does not apply to construction. There have neither been falling profits nor widespread collapses and amalgamations between the major firms".

Altogether it is in harmony with the research hypothesis that an industry with a pre-industrial business model, controlled by a client, works entirely different from what characterizes the market mechanism in industrialised industries. Furthermore, this relationship is enhanced by the barriers to enter the present building industry:

> "One final point to note is that the consistently higher rate of profit for construction in comparison with much of the rest of the economy implies that there are significant barriers to entry to the most profitable activities in the industry. If capital could move freely in and out of construction, the rate of profit should be no greater than the average for the economy as a whole as competitive pressures would quickly reduce any additional profit. While it might be easy to set up a small construction enterprise, to join the ranks of the largest firms is exceedingly difficult. Entry can probably only be achieved quickly through takeover of an established concern, which might be hard to do. Large firms appear to have significant advantages of scale over smaller concerns… Even though large construction firms have relatively little fixed capital, they have market presences and organisational structures which cannot be replicated quickly — either by themselves when they want to expand or by potential new competitors". (Ball 1988 p. 130)

The views regarding how to enter the market are obviously relevant also in the Danish context. But can we take for granted that the existing 'players' will be able to maintain the market for themselves and that no new 'external' players will be tempted by either the high profits or the low productivity in the industry, to introduce a new Building Industry Model, which presumably would be able to both reduce customer prices and make a high profit? New, 'external players' do not depend on the old organizational structures etc. The latter is the transformational approach that resembles the Gutenberg example – and presumably it comes out of nowhere, when the time is ready.

But is *profit in itself* a systemic barrier to change? Probably not. In the context of high market profits, external players would be tempted to enter the market (like the examples from the *building materials* industry, and it resembles the situation when the new self-service 'supermarkets' entered the market for groceries. That was a similar new industrial concept which quickly

conquered a big bite of that market). Where low profit is the problem, the existing players would be interested in the new seller driven industry model according to the general assumption. But they might need help with the transformation process from the government.

Ball (1988) provides a thorough analysis which however, arrives at partly misleading conclusions, because he limits himself in that his analysis is undertaken from the knowledge of one episteme (see section 14.1 and appendix D) only. He does not recognize that the reminiscences of the old craft era, buyer controlled business model exists in the present capitalistic system, side by side with modern seller driven marketing oriented business enterprises from the industrial episteme. The fact that the building industry has no customers, but a controlling client or developer, which prevents productivity increase and causes the market for resale of homes to be un-transparent, which in turn encourages speculation, may both explain that rates of return in construction are consistently higher than in manufacturing and that the 'profits paradox' would confound any conventional analysis.

Had he been able to analyse from the perspective of both episteme, his results had come much closer to reality. But again, the knowledge required - and especially in relation to the building industry - was not available 25 years ago, see chapter 14. That in turn is the contribution of this thesis.

Within the Danish building industry there is a high degree of 'craftsman romance', which may be a barrier to change, but it must be recalled that the entire system must be changed and not only one variable, in order to industrialize the production and offer prices that reflect the 'industrialisation and mass production gains'. This again implies that it is not necessarily the same people and businesses, who continue to work in the industry. It also seems that new educational programmes will be needed to bring about the new building industry.

The Project mode and the buyer controlled procurement model in the building industry entail that it is difficult for the consultants and contractors to develop real business enterprises that accumulate the financial muscles to invest in a genuine industrial development (Byggepolitisk Taskforce 2000) – even if they had the will to do so.

Until today, it has been necessary for the industry to adapt its activities and organizations to the old building process and its project organization, which

entails that the sales activities also had to be adapted to the old procurement model and consequently has not evolved in the direction of the marketing concept and its interdependent relation to industrial production.

Once the projects are transformed to industrial routine production, the procurement model will also have to change to the seller driven marketing model, which implies that the producer and the seller in principle is one and the same. This again implies that the leadership and management of the production process, which used to reside at the client, and by definition does not concern the 'customer', now is the producer's responsibility.

7.5 Sub conclusion – Production mode

Building projects are still conducted as special single assignments. Therefore **two kinds of projects** exist side by side: An old pre-industrial version that is special to the Building Industry and a new one for the industrialised industries. Today the latter is the general standard in most industries.

The two different project types represent two different production modes – in time and substance: The everyday practice in the building industry is still pre-industrial and craft oriented. The client, who controls the building process, has from old times been interested in his own project and not in developing strong enterprises for consultants and contractors. This is a logical consequence of the buyer driven procurement model. *When there are no real business enterprises in the building industry, no management toolbox in regard to routine production and the leadership of enterprises was needed*.

The seller driven industries on the other hand have developed business enterprises, which industrialised the routine production processes and consequently were able to reduce prices, so they could sell to unknown customers, using the marketing management toolbox they developed to cope with the interdependent production and sale. The routine production mode has its own set of variables attached and it seems clear that there are interdependence between the variables in both the building project and the routine production.

Table 7: Interdependence and systemic barriers in regard to the Production perception**.**

Interdependent variables:	**Building project**	**Routine production**
Procurement:	Buyer controlled.	Seller driven.
Customer perception:	Client.	Customer.
Production organization:	Project organized around the client and his needs. Craft based production mode.	Industrialised business enterprise with unified production and leadership.
Leadership and management :	Formally the responsibility of the Client.	Taken care of by the producer / seller

Therefore, there are systemic barriers for a transformational process of the building industry: If you change one variable, you have to replace the whole system to obtain the full effect of the new building industry model.

The companies in the building *materials* industry and most other industries have proven that this transformation process is feasible and not mere 'utopia'.

8. Leadership and management

Having determined to transform the procurement model, buyer perception and to change from projects to routine operation, it is time to examine how to lead and manage this imagined, new building industry model.

As seen in the previous chapters, the production of buildings has since ancient times been organized around the client, his needs and his formal leadership. The client had an objective interest in leading his own project, but not in developing business enterprises for the various categories of building workers. In the lack of real business enterprises, all the leadership efforts were directed towards the old building process, which again was organized in single, special projects. The consultants were paid to represent the client and his interests, the building workers were paid to build and not to develop their own businesses. For that reason, no management toolbox in regard to the leadership of real enterprises was developed in the building industry.

Therefore, in the **pre-industrial context** in the building industry, a direct parallel to **industrial** leadership and management is not found – there is an absence of corresponding business enterprises and their routine operations. *What exists is the leadership style of the old building culture, centred on the client and his project.*

This old Building Process Leadership **(BPL)** is characterised by the client being the principal, who assembles the necessary groups of workers and resources to implement his project and who is the overall leader of 'everything'. The old model was later modernised and known as the 'Phase Model', a development in the direction of 'project management', **$PM_{(pre\text{-}ind)}$** as described later in this chapter.

The opposite situation applies to the seller driven industries, because they were forced to develop business enterprises that were able to sell to unknown customers and to develop a management toolbox, which was fit to cope with interdependent production and sale.

Management in the **industrial context** is the principal planning and control of *the business enterprises' daily routine operation* such as the internal functions like marketing, personnel, economy, and production - to which

project management is a supplement, used for special tasks. The advantage of development projects etc., being a supplement to the routine production, is that the company to some extent gets control over its own development.

This is vital, because the transformational shift focuses on and requires the establishment of business enterprises with a unified production and sale, which entails marketing oriented leadership and management of the routine operations of the enterprise.

However, the transformational leadership and management literature does not describe the progression from the craft era to the industrial. Either it is long since forgotten or it is simply understood that the craft production etc. will 'disappear by itself' as a result of competition from industrial mass production (Schumpeter 1942). Instead the literature focuses on the transformation from one stage to the next within the industrial era, for example Northhouse (2004) and Maurik (2001).

8.1 Leadership and management in the Building Industry

The building industry is characterized by its lack of leadership and management. The industry is marked by its lack of competence and education, the large number of small clients, designers, general contractors and sub-contractors, who are unable to provide leadership (Østergaard 1999 p. 23).

Likewise, the Byggepolitisk Taskforce report (2000 p. 125) concludes that Management seems to be a significant problem in the building industry. Compared with other industries in Denmark, the building industry shows a weak management. The survey concludes that construction is characterized by lack of vision and systematic management. This has implications for earnings. The survey shows that companies which use a systematic management model achieve significantly better results than companies that do not.

The building industry has been allowed to live its own life with many special relics of a distant past, which other industries also have known, but have developed away from long ago. So far the building industry has tried to borrow bits and pieces in regard to management knowledge from the already industrialised industries in order to introduce that knowledge to the building industry. So far this has been without success - if measured by productivity

increase (see chapter 10) - because that knowledge is a 'strange bird' to the industry, and only has a chance to work as fragmented management, or 'from hand to mouth' action in stray corners such as Total Quality Management, Mass Customization, Lean Construction, Information technology, BIM, Project Management, etc., which causes the sector's overall development and progress to suffer, because the sector risks to become a victim of the rapidly changing management fads that are topical. Problems are rarely rooted in a single, isolated topic, but must be understood in a larger context, and the industry has had no focus on the importance of a coherent perception of leadership and management as a holistic discipline.

The fragmented use of Leadership and Management in the Building Industry and at the architect's office is *a consequence of* the sector's pre-industrial mode of production and business culture, characterized by its reminiscence of pre-industrial workman- and craftsmanship, procurement model and buyer perception.

Professionals in the building sector are well aware that the building sector was never really industrialised (SBI 1968) and (Boligministeriet 2000), and many do not regard activities in the building sector as 'production', but as an old building culture to be proud of, since the industry describes itself as delivering 'service' (Østergaard 1999, p. 13). For centuries this old building culture was advanced and was probably superior in comparison with other industries until around the First World War. Still, it can be argued that despite the outdated practice, building projects are rarely entirely failures, such as for instance some of the IT industry's big software development projects for the government (Finansministeriet 2010).

8.1.1 The old building culture

With the relatively few building materials and processes in the craft era (until 75 years ago) and the matching standard constructions (Kjærgaard 1948), which both consultants and workmen were familiar with, because of the old vocational education system, the architects and craftsmen spoke the same language and knew how to play together. This enabled the craftsmen to work as autonomous groups and the client's leadership to aim at the holistic outcome of the project. *The client, however, was not leading a modern business enterprise, but his own exclusive building project.*

While we know the unique manifestations of the medieval building capabilities from e.g. the gothic cathedrals and royal castles, because they are still standing, we know less about the old building process leadership. Most information derives from building accounts and the client's (e.g. the English king's) letters to his subjects on how they were to recruit building workers: According to Tayler (1961):

> »Measures for a more general enlistment of labour are reflected in writs of aid, enrolled under date 16 June (1277), for the king's clerks Master William de Perton and Robert de Belvero, who were sent, the one to the counties of Lincoln an Leicester, the other to "devers parts of the realm", to provide, with the counsel of the sheriffs, masons and carpenters, as many as could be got in whatsoever works or service they might be, and to conduct them whither they had been enjoined.«

From the same source, it is known that the building project was directed by a military engineer-architect and from the building accounts it is known that the workforce of carpenters was organized in sections of for instance 20 men, each under a named charge-hand. They again were led by senior carpenters, like the masons were led by chief masons. Above them was the master of the works or chief architect.

It is also known that the earliest work on the site was the putting up of a timber enclosure of the site and the erection of a variety of timber buildings to accommodate the wardrobe and its related offices, and work-huts for the enlisted workers. The building project also included arrangements for the supplies of food, fodder and general merchandise.

The character of the client's or patron's leadership was mostly concerned with the layout and looks of the building, the handling of personnel and the administration of the building project finances:

> "For the organization of large-scale building projects, there was a building administration committee, usually affiliated to the cathedral chapter but legally independent. ... The office, called the *opus, opera, or fabrica*, managed the building finances and personnel and concluded contracts with the chief masons. ... The administrators could hold office for a fixed period or for life, and were accountable to the individual patron. In most cathedrals this was the cathedral chapter, not exclusively the bishop or abbot" (Toman 1998).

But leading the building process was contrary to modern 'management'; it was not a unified *production* process with one unified leadership. **In the craft era,** work was carried out in well-defined, almost autonomous groups, where

training and leadership was an integral part. Everyone knew his role and place. The leadership discipline sat almost in the genes. The masons, the carpenters etc. each had their own leaders who communicated with the client's consultants in the planning and supervising hinterland. The day to day leadership was delegated to the parties themselves and the necessary coordination was decided on the regular site meetings, of which the minutes later turned into legally binding agreements – like it is common practice today.

The overall leadership of the building process that pre-existed industrial management was conducted by the client's representative, the architect or master builder, who described the work of all the trades, calculated costs, and sat up a master time plan.

This old Building Process Leadership continued in the Danish building industry to the 20th century, but as still more new materials and processes emerged after the Second World War, complexity increased and the old leadership style failed, lacking the proper toolbox. The original, holistic building culture has been exposed to piecework, new kinds of contracts and cooperation, confrontation conflict resolution, economic pressures, and much more, having transformed the culture into a destructive affair, focusing on sub-optimization for each contractor and too often resulting in legal conflicts, as described by Egan (1998). Hereafter, the industry has got the worst of it, resulting in declining productivity and quality problems.

The reason for this is probably to be found in the project production mode, leading to ever shifting project participants, which always are organized around the client and his interests. This again implies that there are no real business enterprises to lead in the building industry, and from that follows that there is no reason to develop leadership and management on a business enterprise level. All leadership efforts were directed towards the old building process and its projects.

8.2 Leadership and management in industrialised industries

While leadership as a concept and practical discipline is rather ancient, management (in its present, contemporary meaning) on the other hand is a relatively new phenomenon that is linked to the industrialisation that took place after the Second World War.

The word *Leadership* originates from *leader + -ship (= to create, from old Germanic 'skap', common to Danish (='lederskab'), German, Anglian, Dutch)* meaning to lead in a creative way, like sailing a ship: Setting the course, finding way in the dark and stormy weather, and knowing where to sail tomorrow. Tactics and strategy in connection with leadership derives probably from military thinking, examples of this are Sun Tzu (1993), who lived 500 B.C. and Carl von Clausewitz (1780-1831) as described by Clausewitz (1976).

The word *Management* originates from the verb to *manage* that derives from Latin 'manus' (=hand) and was adopted into French via the Italian 'maneggiare' (to handle e.g. tools). The French word 'management' influenced the development in meaning of the English term management (assessment, planning, control and execution) in the 18th century. Before the industrial revolution, most enterprises were relatively small and the owners carried out management functions themselves, typically not in a systematic way. But with growing size and complexity of the enterprises it became more common for the owners to take on 'managers' to assist in planning and control (Drucker 1999).

In this study, management will be regarded in a similar way as Peter F. Drucker (1909 - 2005), who sees management as a concept that becomes important, parallel to the new wave of industrialisation after World War 2, where management was coupled with another new conception: The organization (Drucker 1999).

Mary Parker Follett (1868–1933), had according to Drucker (1999) defined management as "the art of getting things done through people" and this application of management was used by the Allied Forces during the Second World War, to develop systems to manage large military units or in other words, large organizations, in order to make them operational or 'productive'. Hereafter, management theory was connected to the need for an organizational structure. Following the post war demobilization, the discharged officers, who were accustomed to think strategically along those lines, were employed in the large business organizations in USA, and 'management' turned into a buzzword. The big business enterprises needed management and organisational structure to fulfil the demand for consumer products after the years with war production.

In the industrial and science based era, management theory first emerged in the 1930s, apart from the predominantly practical application of 'Scientific

Management' (Taylor 1911) at the beginning of the 20th century, which tried to move the knowledge part of the skilled workers jobs into the machines and the processes. Nevertheless, Taylor's scientific management did not prevail before World War II, because of union pressure, the Great Depression, and the following hostility to everything that would create unemployment among workers. But the situation changed after the Second World War, when management theory was connected to the need for organizational structure, which Taylor never recognized (Drucker 1999). As a management concept, it is a new thing that the organization and management belong together even though their purposes are different:

> *The mission of the organization is to **reduce environmental complexity** through **creating a safe and manageable version of the outside world** and its history, enabling the employees to become productive (Qvortrup 2001).*
>
> *Its parallel is the management system that is coping with complexity by producing **stability** and providing the necessary **certainty** that the organisation is in control of the operation (Kotter 1990).*

In contrast, the building industry is characterized by an ever *changing organization* (from project to project) and there is no management system, but an old mode of Building Process Leadership, which in its core is culture based and influenced by the unpredictability in relation to time and schedules, economy, quality and hence ***'total' uncertainty***.

The seller driven industries and service businesses have since the Second World War largely been inspired by American leadership and management and as such management was directed towards rationalization and *mass production* until after the 'oil crises' in the late 1970's, when the need for a new set of theories became evident. The focus turned towards the organization as an instrument to enable people to be ready to *adapt to the changing market conditions*, to increase productivity by working together in teams, and to concentrate on customer satisfaction instead of mere mass production etc (Drucker 1999). This led to new concepts like *mass customization*, which resemble craft based production in its focus on small segments, but uses industrialised mass production, CAD-CAM technology to lower prices.

According to Drucker (1999 p. 9) "Management is the specific and distinguishing organ of any and all organisations" from this time forward (except in the building industry as shown above). In some situations a

hierarchy is required (the captain on a ship in an emergency situation) in other routine situations, team work is vital.

Transparency is important, the employees have to know and understand the structure they are part of and a flat organization is sound because information noise doubles for every layer (Drucker 1999). This also makes sense, as the purpose of the organisation is to reduce complexity, according to Qvortrup (2001). Also Drucker (1999, p. 3) states that the basic assumptions about reality, *shape* the paradigms in social science, such as the study of management.

However, once again the basic assumptions are not the same in the pre-industrial building industry as in the industrialised sectors, since they deviate in regard to important systemic conceptual formations, such as the procurement model, buyer perception, production mode etc.

The present-day industrial business enterprise has developed the organisational, leadership and management toolbox, not available to Gutenberg and his contemporaries, and has proven the supremacy of the Seller Driven Marketing Model. See table 8 below. In the building industry, however, the situation is different.

Table 8. Kotter (1990) inspired the following distinction between leadership and management in contemporary companies:

Leadership	Management
Horizon: Dealing with the **Future**	Dealing with the **Present**
Purpose: To Produce change	**Purpose**: To Produce stability
Coping with fast technological and demographic change, international competition etc. **Sets the scene for change**.	Coping with complexity and large organizations.
Setting a **new direction** and developing a **vision** of the future plus a **strategy** for implementation. Leaders align people.	Organizational structure, staffing and delegating responsibility for carrying out the plan. Systems to monitor implementation. Managers organize people.
Motivating and inspiring people to move in the right direction.	Control and problem solving.
Setting a direction is more *inductive* (from concrete facts or data to abstract thinking), looking for patterns and relationships that help explain things and help create vision and strategy, meant for change.	**Planning**, budgeting and even long term planning is always a management process, *deductive* in nature (from the abstract vision to concrete plan and action), meant to produce order.
Describes a future business, technology, or corporate culture, which articulates a feasible way of achieving the vision.	Planning works best as a complement to direction setting – not as a substitute.
The crucial thing about a **vision** is not originality, but that it **serves the interests of the customers** and other stakeholders. It should not favour the owners or employees over customers.	**Control mechanisms** compare system behaviour with the plan and take action when a deviation is detected.
Motivation – coping with inevitable **barriers to change**.	The purpose of systems and structures is to **help normal employees to complete routine jobs** successfully. That's management. It doesn't require motivation or inspired behaviour.
In a system's perspective, e.g. according to Qvortrup (2004) leadership and management would deal with:	
The external complexity (of the organization's environment, which is a leadership domain).	**The internal complexity** (of the firm's organization, which is a management domain).
The purpose is to reduce complexity in the environment through knowledge, acquired in a learning process.	The purpose is to reduce complexity in the organization through knowledge, acquired in a learning process.

8.3 The concept of Project Management

If $P_{(ind)}$ # $P_{(pre\text{-}ind)}$ - what about project management?

As shown in the previous chapter, the two different project concepts describe two different environments for leadership, which assigns two different roles to the leadership of projects.

The role of industrial project management is to serve as a supplementary activity to the primary leadership and management of the business enterprise's daily routine operation, while the pre-industrial project leadership is grown out of the old buyer controlled procurement model and works as a standalone leadership system for single assignments.

In addition to this, what separates the old and new project management concept is, respectively the role of the client or customer, and whether there is a primary business enterprise with attached leadership and management system, or not. (See previous chapters).

'Project management': ~ the approaches to planning, executing and controlling a project, using analytic, deductive methods.
The old *building project* leadership model was copied and transformed by industrialised industries after the Second World War to an *'industrial' project management model,* while the building industry still has its own leadership model. In this way we have two types of project management:
Project management, $PM_{(pre\text{-}ind)}$. The pre-industrial building process leadership activities designed for leading projects, $P_{(pre\text{-}ind).}$ This is the original 'project management', which we still find in the building industry and today often refer to as the Phase Model. (See 8.4.1).
Project management, $PM_{(ind)}$. The industrial leadership activities designed for managing projects, $P_{(ind)}$. This is the project management in the industrialised industries, which today is the standard outside the building industry. (See 8.5).

8.4 How is $P_{(pre\text{-}ind)}$ managed in the Building Industry?

The building project management system is wrecked. A report (BUR 1990) described that the input of man-hours in 1986 was twice as big as seventeen

years earlier in 1969 when comparing similar building projects (Kristiansen, Emmitt and Bonke 2005).

From the late 1960s, research was launched in Sweden and Denmark to systematize and streamline the old building process in order to enhance the possibilities to manage 'the eternal triangle', quality, costs, and time in a building project. In Denmark this work was conducted by SBI, The Danish Building Research Institute, and the result was the "Phase Model" as the building industry knows it today and still work according to, although it has been revised a few times since then, so the model can be modified to different needs, such as partnering or other variations of the Buyer Controlled Procurement Model. This has become the 'project management' of the building industry.

8.4.1 The Phase Model

Also in the UK a similar model is used: 'The RIBA Outline Plan of Work, 2007', which is a related version of the Phase Model, supplemented by the Architects 'Construction Project Management' (Murray and Langford 2004), which is an attempt to utilise the "Outline Plan of Work" into a sort of project management that originate from the pre-industrial era.

It was suggested that the building industry should learn from the industrialised industries' production methods and production management. But at the same time there was an awareness that the manufacturing conditions in the building industry were different and therefore could not fully be adapted to the industrialised industry standard. But nevertheless SBI (1968) suggested that the building industry progressed in the direction of industrial production and management (quotations in Author's translation):

> **"The problem - the divided production**
> When it is a problem to manage the building process; i.e. in advance to determine the house's qualities, time, and price; it is primarily due to the fact that houses are produced under different conditions than other products. The building industry has a different structure than other branches of production. Buildings are traditionally produced individually, are different from each other and every time by many independent producers: Many contractors, suppliers, and consultants. This mode of production is different from other industries and also many crafts, where one manufacturer is solely responsible for series of multiple identical copies of a product.

The means – the rational principles of production

The increasing demand to define the product, price and time also in construction, therefore underlines the question of in what way the construction industry can learn from more rational modes of production in other industries.

The means of production that have proven useful in the current production in other industries cannot simply be introduced in the production of buildings. There are too many differences, partly because much construction still takes place on the building site for each house. But the principles of the production in industrialised industries can be adapted and utilised in construction. The last years of development in this direction shows that there are big gains, yet far from being exploited.

The most important principles of production, which the building industry now has to implement in full, are[14]:

1. **Reiteration**, the main basis for every rationally organized production.
2. **One leadership** that ensures coordination of the approach of the many actors, to a rational production.
3. **Definite program**, expressing the client's desires and limitations clearly and detailed, as the basis for the project design - which must not change, when the detailed design is started.
4. **Complete project**, designed to calculate time, costs and work planning.
5. Planning the progress of work.
6. **Personnel management** and ongoing monitoring and correction of the work plans.
7. **Cost calculation of work done**, so experience, time and prices can be collected systematically, as a basis for future assignments"

The political justifications for these proposals were:

> "The building industry must, like other industries contribute to society's general prosperity increase. This requires an increase of the productivity in construction; i.e. the production of more building value with the same effort" (SBI 1968 p. 7). (*Author's translation*).

As mentioned by SBI (1968 p. 6), there was full awareness that:

> "The means of production that have proven useful in the current production in other industries *cannot simply be introduced* in the production of buildings. There are *too many differences*, partly because much construction still takes place on the building site for each house". (*my italics and translation*).

This suggests that SBI did not imagine that they could force the industrial mode of production on the construction industry, knowing the tradition, organizations, workforce and production equipment in the building industry.

[14] Also referred to as "The 7 commandments"(SBI 1968).

But SBI was convinced that the building industry could learn from the industrialised industries' production methods and production management and that these principles could be borrowed and transferred to the building industry (SBI 1968 pp. 6-7):

> "But the principles of the production in industrialised industries can be adapted and utilised in construction. The last years of development in this direction shows that there are big gains, yet far from being exploited". (Author's translation).

SBI probably imagined that a gradual, gliding transition from the old craft based production and leadership mode to the industrialised mode, was possible. *The last 43 years of development has not presented any indication that this is going to happen, making this assumption very unlikely.* Instead this lack of development in the building industry indicates that the differences are systemic and that the production and leadership elements in the two sectors are incompatible. My research hypothesis is exactly about this key point.

However, already in 1971 a new instruction report (SBI 1971) saw the building process as two separate processes: "The building process divides into two main sections: The planning of buildings and the construction work"; and therefore changed the description from *one unified process* and *one leadership* to a divided process accordingly.

The purpose of the SBI (1971) instructions was to rationalise the first phases of the building process, which was conducted by the architects and engineers: The programming, outline and final proposals stages of the phase model. This Phase Model was adopted by the organisation of the architectural firms and the engineering firms in the building industry; and is e.g. used to describe their services in their standard contract with clients.

But evaluated today the Danish phase model is at best insufficient as a management tool, because it is directed solely at the client's *production* interest, and does not contain any trace of management of either the project's or the project participants' personnel, communication, finance, quality, time etc. Furthermore the phase model assumes that the consultant squarely identifies himself with the client and assumes his procurement interest (similar to an employee) – there is no room for independent business enterprise interests on the part of project participants. The seller driven marketing model similarly requires the seller to satisfy the needs and wants of the customer,

because the seller in this way serves his own interests in the long run. But it is supposed to be an advantage for both customer and seller.

The two SBI instruction reports represented a *detailed teaching* in how to understand and progressively work according to the phase model, emphasizing the importance of cooperation between the various groups, but still providing the client with the opportunity to terminate the consultant's contract after each phase. Overall the two SBI reports represented a modernization of the old Building Process Leadership, and the resulting Phase Model can be regarded as a pre-industrial method (a kind of substitute for industrial project management) to control single assignments in a situation without a functioning concept of a business enterprise, as described in chapter 7 or as SBI (1968) states: "There is not only one manufacturer, who is responsible for the production..".

It was a suggestion for a more streamlined approach, neither industrial leadership and management, nor industrial project management, but it must be regarded as a serious attempt to drive the building process in a more effective direction. Nonetheless, it proved difficult to get the industry, wholehearted and effectively to follow the instructions and probably most professionals never learned the basic systematism and methodology that a *productivity* success of the phase model required.

The Phase Model was never included in the formal education of architects, who nearly exclusively study the creative sides of the first sketch phase during their education, and are neglecting the more prosaic and practical aspects of the architectural profession. Architects are presumed to learn these competences subsequently, during the first years of employment – by other architects, who never learned the model themselves (Barrett 2011).

Therefore the practical application of the phase model is rather loose, also often caused by the client, who sometimes is not willing to pay for the phases, following the statutory approval of the project, meaning that the detailed technical drawings are skipped and solutions are left with the contractors. The confidence in the effect of trying to blend industrial production methods with the old building process is not new, but four decades of missing results indicates that a more fundamental understanding of the basic problems in the building industry must be adapted, because the same problems with low productivity and lack of development continue.

This is in good harmony with the research hypothesis - it is not possible to attain real progress by borrowing some aspects from the industrial world, while the old building process is left intact; it is not possible to mix elements from the pre-industrial and industrial eras and expect them to work together in a productive and effective way. To accomplish that, it is necessary to replace the building process with industrialised production and simultaneously deal with the procument model and other special problems in the building industry.

8.5 How is $P_{(ind)}$ managed in industrialised industries?

Apart from the vital project environment differences, the *abstract* description of project management across the pre-industrial and industrial eras is rather identical:

Table 9: Typical characteristics of *project management* according to PMI (2004):

	Project management characteristics, $PM_{(ind)}$
Definition	The application of knowledge, skills, tools and techniques to the project, to meet project requirements.
PM process stages. *Some are iterative.*	Initiating the project. Planning the project. Executing the project. Monitoring and controlling the project. Closing the project.
Objectives	Identify requirements. Identify achievable objectives. Balance competing demands for quality, scope, time and cost. Adapt specifications, plans, and approach to the different concerns and expectations of the various stakeholders.
Project quality affected by	The balance between Project scope -time and cost.

But because the object, which is managed (the two project versions) vary; the project management also results in two different kinds of leadership.

8.6 Differences

The building industry still maintains the old way of doing things. A building is commissioned, there is a tender and eventually a 'project' group is formed. That group is typically not the same from assignment to assignment and the building industry has no formal procedures for feed-back and learning. As a consequence of the constantly changing participants in the project groups, the parties sub optimize for themselves as a means to survive (Benspaend 2011). The consultant's fee is often a percentage of the building's costs and therefore they have little incentive to reduce costs, the contractors often have few incentives to co-operate, sometimes it is profitable to stay away and delay the project. Therefore project management in the eyes of the client often degenerates to 'legal contract management' (Koskela and Howell 2002), emphasising the legal aspect of the process. The whole thing turns into a legal 'conflict potential' instead of a management discipline.

Table 10: Differences between $PM_{(pre\text{-}ind)}$ and $PM_{(ind)}$

Building Process Leadership, BPL ~ $PM_{(pre\text{-}ind)}$ - seen from the architect's point of view	**Project management,** $PM_{(ind)}$
Developed as a fully integrated leadership and educational system, based on the old culture in the Building Industry. In this system the architect takes his starting point in the 'Phase Model for the Architect's Plan of Work' (See e.g. RIBA Outline Plan of Work 2007. The work stages into which the process of designing buildings and administering building contracts may be divided.), Supplemented with tools to control time, costs etc.	Adapted as a **supplement** to the primary leadership and management of the business enterprise. Even though the term 'project' derives from the building tradition, the modern project management concept is developed to operate in an industrial management environment.
Developed for the old trade and craft production mode, where business enterprises were absent. The client's project and the building process were headed and controlled by the client's leadership.	$PM_{(ind)}$ works as a supplementary system in an industrial environment with a fully implemented primary leadership and management system for the business enterprise.
Traditionally the architect was working in the project as **the client's consultant,** dealing with the project in the interest of the client. He would identify himself with and think in terms of the project. He would not pursue independent business interests, which explains the week position of the architect firm and why the architects never implemented an independent leadership and management system to manage their own firms.	But in terms of modern project management and seen from the position of the architect firm as a *business*, the client would be just another customer and the contribution of the architect would be the normal daily routine business. The architect would try to meet the 'needs and wants' of the customer and while succeeding in this, consolidate his own business.

8.7 Barriers for the transformation of leadership mode?

The building materials industry managed to industrialize its production (Madsen 2000) and to change to the seller driven marketing model, which permitted the development of independent business enterprises that were strong enough to decide their own strategy. Will the building industry be able to do the same?

To begin a transformational process of the building industry is a question of daring to take the decision, which is a typical *leadership* matter, while planning and controlling the implementation of that decision would be a management task. It is just like the Gutenberg example; where there is a will, there is a way. However, it is a big decision that involves courage and a considerable economic investment and a significant risk-taking, but apart from that, there are no barriers that prevent an investor from taking the trail of Gutenberg.

8.7.1 Interdependence?

The transformational process from the old to the new building industry model is a typical systemic decision, as illustrated in table 11.

Table 11. Interdependence and systemic barriers in regard to the Leadership perception.

Interdependent variables:	**Building Process Leadership.** Formally the responsibility of the Client.	**Marketing oriented** leadership and management by the producer / seller
Production organization:	Work is organized around the client and his needs as a project, originating from the craft era.	Industrialised business enterprise with unified routine production and unified leadership and management, supplemented with projects for special tasks.
Procurement:	Buyer controlled.	Seller driven and led.
Buyer perception:	Client.	Customer.

It entails a change of all the systemic variables of the industry: Procurement model, buyer perception, production mode and leadership and management, because they are specific to either the old or new building industry model.
It is not likely that the variables are interchangeable between the old and the new building industry models and therefore they are interdependent.

8.8 Sub conclusion - Management

In the industrial context, leadership and management means the leadership of business enterprises and it is the seller and not the buyer who directs the production process.

In the pre-industrial context and particularly in construction, leadership and management do not exist in this sense. Here it is the client (the buyer) who formally heads the building project (the acquisition of the building) and objectively the client is only interested in his own project - not in the workers' enterprises. Therefore, such enterprises typically are not given an independent existence.

This leadership practice in *the building industry* is ancient and the leadership concept is pre-industrial. The symptoms of the absent development in the building industry mainly point to the industry's systemic lack of ability to change, and indicate the lack of both pertinent education and training of the consultants, who typically have no formal leadership competences, to point in the direction of the future. Only 1 % of the employees in the Danish building industry have an education at academic level (see section 10.5, figure 7.

An *industrialised business enterprise* on the other hand has its own leadership and management and is headed by its own leaders, who most frequently are well educated in leadership and management. Their buyers only have a *customer* relation to the business enterprise and do not interfere in leadership.

The Consultant's leadership in today's building industry

Engineers in the building industry in the Author's experience try to implement and use Project Management, $PM_{(ind)}$, which they are familiar with from their education to plan and control a building project. Project management can hardly be used as a short cut to 'a sort of management', because in this case, project management is used in a non-industrial environment without primary leadership and management, because of the obsolete production mode and the lack of an industrial business enterprise.

Architects typically use the 'Phase model' as their work method, to control the progression of the building project, supplemented with tools to control time, economy etc. In addition to this, most CAD applications are adapted to this Phase model, implicating that instead of using information technology to

transform the old building process, the CAD applications have been adapted to the old building process.

So the building industry has its own culture and not the least the architects, who work in a special way, do not benefit from modern project management, $PM_{(ind)}$ as long as the building process is not changed.

The Contractor's leadership in today's building industry

The contractors in construction (who carry out the ideas of the architect) are typically 'immune' to the very idea of management. Their practical experience with the usually unpredictable course of a construction project, have induced them to develop a deep-rooted, reluctant attitude towards management and transformation as indicated by Byggepolitisk Taskforce (2000). This is probably influenced by their work taking place at the construction site, out in the open, exposed to wind and weather and the various cooperation problems that are a faithful companion to the ever-changing project teams.

What should be developed by both consultants and contractors is the attitude of treating 'to build' as the daily *routine* operation, and assignments as *normal customer orders,* which the new building industry should learn to relate to and generate, using leadership and management, once the corresponding business enterprises have been developed.

9. Conclusion – barriers?

Most sectors have managed to change their mode of production away from obsolete manual workmanship towards automated industrial production; for instance using CAD / CAM industrial routine operation, supplemented with projects for special tasks. Most industries have managed to move away from tenders as the predominant procurement system towards a marketing oriented system, where the seller initiates product development in order to satisfy customer needs and wants *initiated and monitored* by a corresponding leadership and management system and these seller driven industries have all together inclined productivity to the benefit of the customers, see chapter 10.

But the building industry has not been able to do so, even though the obstacles for changing the building industry are not any harder than they were for other industries, but they are perhaps *different*, because a transformation has been awaited for so long. The barriers for transformation vary, according to what environmental system is regarded, as shown in table 12:

Table 12: Obstacles for the transformation process

Political obstacles	Public clients have to use the Buyer controlled procurement model, but private clients are free to shift to the seller driven procurement model.
Economic obstacles	It requires a considerable economic investment to set up the necessary production facilities.
Technological obstacles	No barriers. Technology and know-how is already present.
Cultural obstacles	The old building industry culture is very strong and the parties tend to be rather conservative. Customers might have barriers towards industrialisation and prefabrication (fear of monotonous design, lower quality, and romanticized attitude to craftsmanship). But the customer resistance can be overcome by proper price reductions as a result of industrialisation and more creative product development.

Those differences include:

- The political mandatory requirements for using the buyer controlled procurement model whenever a public client is involved, represent a setback for any incitement to experiment with the seller driven marketing model.
- A considerable risk for the investor, who dares to set up a business enterprise according to the new building industry model, because the market for

buildings, traditionally is used to regulate the general economy in society and the market is disturbed by speculators, causing prices to move in big cycles.

- The cultural barriers should not be underestimated. Enterprises and employees in the present industry do not show much interest in changing to the new building industry model. Changes must come from outside, just like Gutenberg, who was a metal worker and not a scrivener.
- As seen in table 13 it takes a complete systemic change to gain access to the industrialisation gains that might bring about considerable price reductions, as have followed in other industries that were industrialised:

Table 13: Major differences between the old and new building industry

Old Building Industry	New Building Industry
Production organized in **Projects, $P_{(pre\text{-}ind)}$** that are stand alone assignments, organized around the Client, his needs and leadership. Every project includes: Design, 'Product development', 'production', and all Leadership activities. Each project is a unique production, predominantly craft based.	**Production organized as both routine operations and Projects, $P_{(ind)}$** which **are special** supplementary arrangements to cope with non-routine activities, isolated from daily operation, so they do not interact with the routine operations, which generate the revenue...
The buyer has the initiative, not the seller and p**rojects** are attached to the **buyer driven procurement model.**	**Projects** will work with both the buyer and seller driven model. Most frequently used for 'one copy assignments' – normally development tasks.
The purchaser is a **client** or principal with formal leadership obligations.	On the demand side, the purchaser is a **customer** without leadership obligations.
Leadership: The Building Process Leadership implies that the client is a part of the process and bares the overall and general leadership responsibilities, e.g. together with a consultant, who acts on his behalf. In practice the daily management is delegated to the parties themselves.	Leadership divided into two: Both Leadership and management of the business enterprise and $PM_{(ind)}$. The customer has no leadership responsibilities. The project management appointed by the enterprise takes care of the leadership, formerly carried out by the client. The daily routine business calls for leadership and management of the mother company – as well as the flow of projects.
Projects seen from the architect: From way back based on having ***different clients, cooperation partners****, and location* for every new assignment. Therefore the organisation of the 'production' varies from project to project.	The production location is fixed and the business enterprise is in control of the organisation, which is seen as an object of the management toolbox.
Because $P_{(pre\text{-}ind)}$ was organised around the client, there was **no need for developing real business enterprises**.	The seller driven marketing model presupposes the development of **independent business enterprises** on the supply side.

9.1 Barriers to transformation?

Each variable is specific to either the old or new building industry model implying that it is not possible to cut corners, for example by attempting to use industrial Project Management on pre-industrial projects, or to try to ignore the old buyer controlled procurement model, see table 14.

The variables are not interchangeable between the craft and industrialised production modes, because of their different and conflicting focus on 'skills' and 'productivity'.

Or put in another way: An old, inefficient mode of production cannot be made effective alone by adopting e.g. the leadership and management practice of other more developed production modes.

Table 14. The outcome of the 6 possible relations between the variables.

:**The 4 Variables and their relations:**	**Old building industry**	**New building industry**
Procurement model	Buyer controlled	Seller driven
Buyer Perception	Client	Customer

Procurement model	Buyer controlled	Seller driven
Production	Building projects$_{(pre\text{-}ind)}$	Both routine production and projects$_{(ind)}$

Procurement model	Buyer controlled	Seller driven
Leadership and management	Old building process leadership – the Phase Model.	Marketing oriented leadership and management plus project management.

Production	Building projects$_{(pre\text{-}ind)}$	Both routine production and projects$_{(ind)}$
Buyer Perception	Client	Customer

Production	Building projects$_{(pre\text{-}ind)}$	Both routine production and projects$_{(ind)}$
Leadership and management	Old building process leadership – the Phase Model.	Marketing oriented leadership and management plus project management.

Buyer Perception	Client	Customer
Leadership and management	Old building process leadership – the Phase Model.	Marketing oriented leadership and management plus project management.

There are no barriers to implementing an isolated transformation of a single variable separately, except that the intended effects (the rationalization of production, increased product development, improved customer satisfaction, reduced price, and professional marketing-oriented management) do not occur unless all variables are changed simultaneously. *This complicates and leads to a fragmented understanding of the nature of the transformational process*.

It is simply difficult to imagine a new, industrial building industry apply a buyer controlled procurement model, where the client is heading the production process, which is organized in projects with ever changing participants who are not subject to effective management, but delegates management to the parties themselves; rather than to implement the simple concept: One production, one leadership?

Or can anyone imagine the old craft based building industry apply an advanced seller driven procurement model, producing in factories, and marketing to unknown customers, etc. … it would simply no longer be the old building industry, but a new transformed version!

Therefore, a real change and not just minor adjustments of the old building industry requires that the industry dares to break with the system of the old building industry and dares to go for the new model.

Looking at the **practical, technological** aspects, there are no genuine barriers, but in reality there is a *systemic barrier*, because the entire pre-industrial system has to be transformed to the industrial system at the same time, to lead to major productivity increases and product development with price reductions instead of increasing prices.

This constitutes the major barrier for a transformation of the building industry: All four variables must be changed simultaneously, if the required increase in productivity is to take place, enabling the desired reduction in prices to the benefit of the customers.

The fact that the barrier is systemic is an indication of 'interdependence'.

9.2 Barriers to transformation and the hypothesis

So far, it appears that there is a systemic barrier for transformation and that the variables of the two systems considered (the old and new building industry model) are interdependent within their own system, *which implies that the hypothesis can be accepted.*

This suggests that a systemic transformation to a Seller Driven, Industrialised Building industry is possible – *that it is not just a radical utopia that one has to imagine.*

Anyhow, a transformation from the old to a new building industry model is not going to happen from one day to the next.

But can we find evidence to indicate that such a seller driven marketing model will perform better?

Closer examination of the productivity development in the building industry and other industries may indicate whether it is worthwhile to aim at transforming the building industry.

Part III. INDUSTRY MODEL AND PRODUCTIVITY

10. Productivity as an indicator

...An important indicator of the validity of the research hypothesis would be to show that the old buyer controlled building industry model is performing worse than the industrial seller driven industries. Therefore I will investigate some of the available pertinent productivity studies, statistical data etc. to clarify the relationship between productivity and industry model...

10.1 Comparison of productivity in specific projects

Most productivity surveys are based on aggregated data for whole industries. Surveys covering specific building projects would probably have a higher information value in relation to this study, and fortunately, one of the most detailed studies on productivity in the building industry was initiated by The Danish Building Development Council (BUR 1990). This survey compared productivity (measured as consumption in hours per gross m^2) in three housing projects from 1951, 1968 and 1986.

The project from 1986 included a site with 130 homes, distributed in 1, 2, 3, and 4-room dwellings, with emphasis on 2 and 3 room homes, totalling 9,838 m^2. The residences were built according to the rules of social housing in one and two storeys with a prefabricated carcass. This housing project was compared with similar projects from 1951, 1968, see table 15, where the number of hours per m^2 that was consumed on the building site are shown:

Table 15: Productivity in specific Danish housing projects 1951, 1968, and 1986

	1951	1968	1986
Hours / m²	***24,4***	***4,1***	***8,1***
Production mode:	100 % craft based brick houses.	Prefabricated in series production with prefabricated façade elements.	Prefabricated concrete carcass but with varied situation plan and brick facades, erected on site.

As BUR (1990 pp. 4-5) commented:

> "Without seeking to quantify, it is BUR's understanding that the construction productivity and effectiveness over the last 10-20 years have decreased. There may be several acceptable explanations: Minor construction projects, increased demands for variety ...
>
> However, certain trends are obvious.
> It is striking that the study shows a doubling of hours spent on the construction site from 1968 to 1986...
>
> When comparing this with the fact that the production of building components in all respects has followed the rationalization in other industries, this raises several questions. Are the thereby liberated resources translated into higher wages or are they fully or partly devoted to improving quality or variety?
> Has there been a shift in construction from the factory back to the building site?
> Is it reiteration and the large series in the 1968 project, against smaller series with increased demands for variety and environmental improvements, which explains the difference?
> Do the specific figures point to that the explanation is to be found in the design of certain building parts, for example the facades?
> Has rationalization gains in the production of component and materials resulted in lower prices or higher profits?
> Is efficiency at the building site reduced because of inadequate organization and management of the building process?" (Author's translation)

In 1951 craft production was at a peak level both in regard to quality and productivity; in1968 the prefabrication of large series of similar flats, organized in multi-storey blocks along the crane track, probably was at its peak level, increasing productivity by a factor 6 in comparison with 1951. In 1986 productivity had decreased by a factor 2.

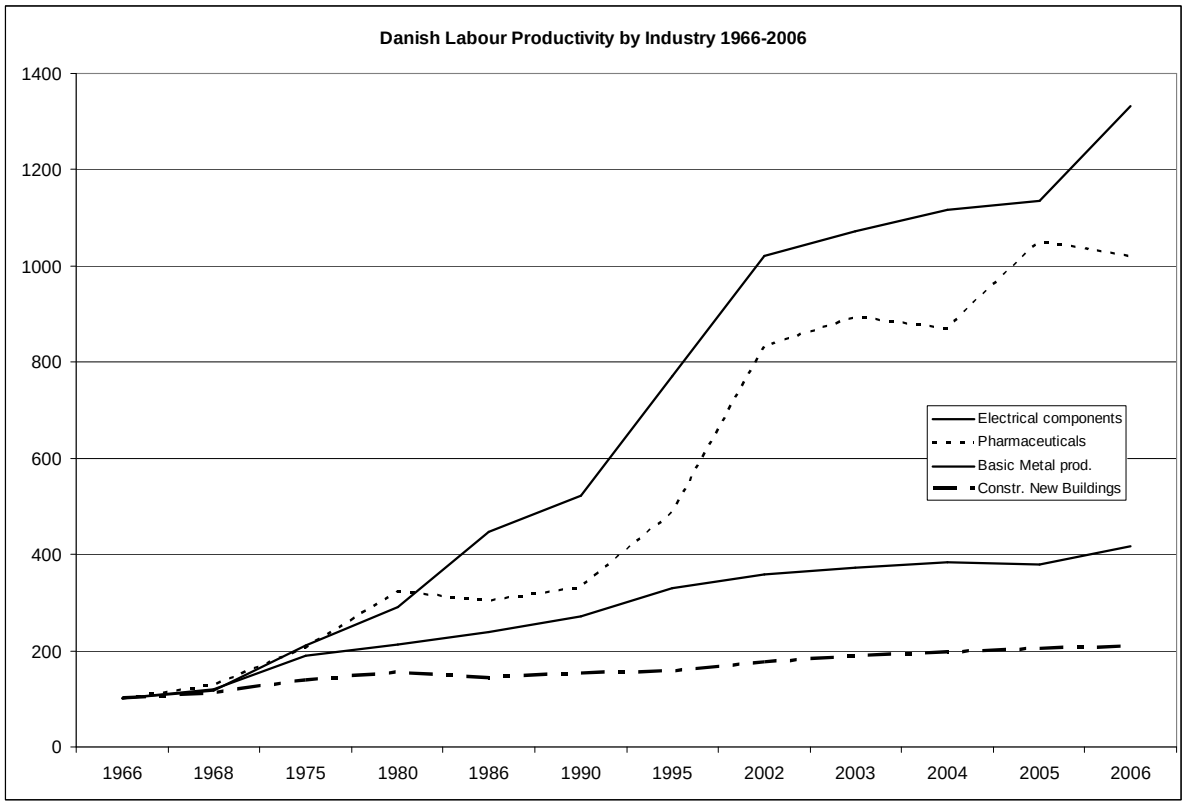
A range of possible explanations could be posited for the decline, but what is important in this context is that this study apparently indicates that productivity increases with the degree of initial industrialisation, and falls again with decreasing repetition effect and re-introduction of craft based processes.

But with section 1.2 in mind (the cost of housing increases in spite of increasing productivity), a non-systemic change of just one parameter (industrialisation of the production) does not seem to lead to both higher productivity and lower prices. The transformation of the Danish building process seems to be a long lasting process with ups and downs.

10.2 Industry model and productivity

In chapter 5, it was said that a shift in procurement model from the old buyer controlled model to a seller driven model would enhance productivity etc. There are no surveys covering exactly that relation, but the Danish Statistical Bureau has collected data for the labour productivity distributed by industries.

Figure 4: Productivity in some seller driven industries compared to Construction of new buildings.



(Author's graph, 2011, based on Danmarks Statistik, statistikbanken.dk. NAT 23: Labour productivity by price unit, industry and time)

In figure 4 above the productivity of the predominantly seller driven industries: The manufacturing of electrical components, and manufacturing of pharmaceuticals have increased productivity more than ten times over the viewed 40 year period. The basic metals and metal products industry was industrialised early and has 'always' had a relatively high productivity; it is basically seller driven, although many enterprises are subcontractors to the German industry. Yet, from a high level, it still manages to increase productivity by a factor of four over the viewed 40 year period.

In contrast to this, the buyer controlled building industry has only doubled its productivity (only construction of new buildings, which has the highest productivity, is viewed).

This modest increase in productivity in the building industry must on the one hand be evaluated taking into consideration that from World War II to 1966 the building industry had increased productivity considerably as a result of the initial attempts to industrialize the building industry, meaning that the start level is relatively high. Also the many new improved standards in construction have affected productivity negatively. For example, the whole energy issue (insulation work etc.).

But on the other hand it is worrying that the increasing proportion of prefabricated materials, components, and subassemblies, which were utilised along with the emergence and growth of the building materials industry, has not resulted in a more significant increase of productivity. While e.g. the joiner previously manufactured doors and windows in his workshop, the building materials industry took over and therefore only the fitting of doors and windows is included in the productivity statistics of the building industry, which means that the amount of work on the building site has been considerably reduced during this 40 year period.

All things being equal, this is a strong indication that the seller-driven industry model is superior in regard to productivity development, but of course this is only a strong indication of the existence of such a relation, not a solid proof.

But the important thing is that the Seller driven industries both increase productivity and reduce prices, exemplified by the price of a radio, which during the period drops to a fraction of the starting price (from the wages of a month to an hour) as opposed to the construction costs of an apartment.

10.3 General causes for productivity increases

Closer examination of the Danish productivity development reveals that the annual, average increase in productivity per work hour in the total market based part of the Danish economy (excluding the big public sector) was 2.7% for the years 1988-2000 (Danmarks Statistik 2004). This report explains the causes of the increased labour productivity in the Danish context as follows:

37 % is explained by capital investments (out of this IT related investments in software and hardware represent 22% and machines + buildings 15%).

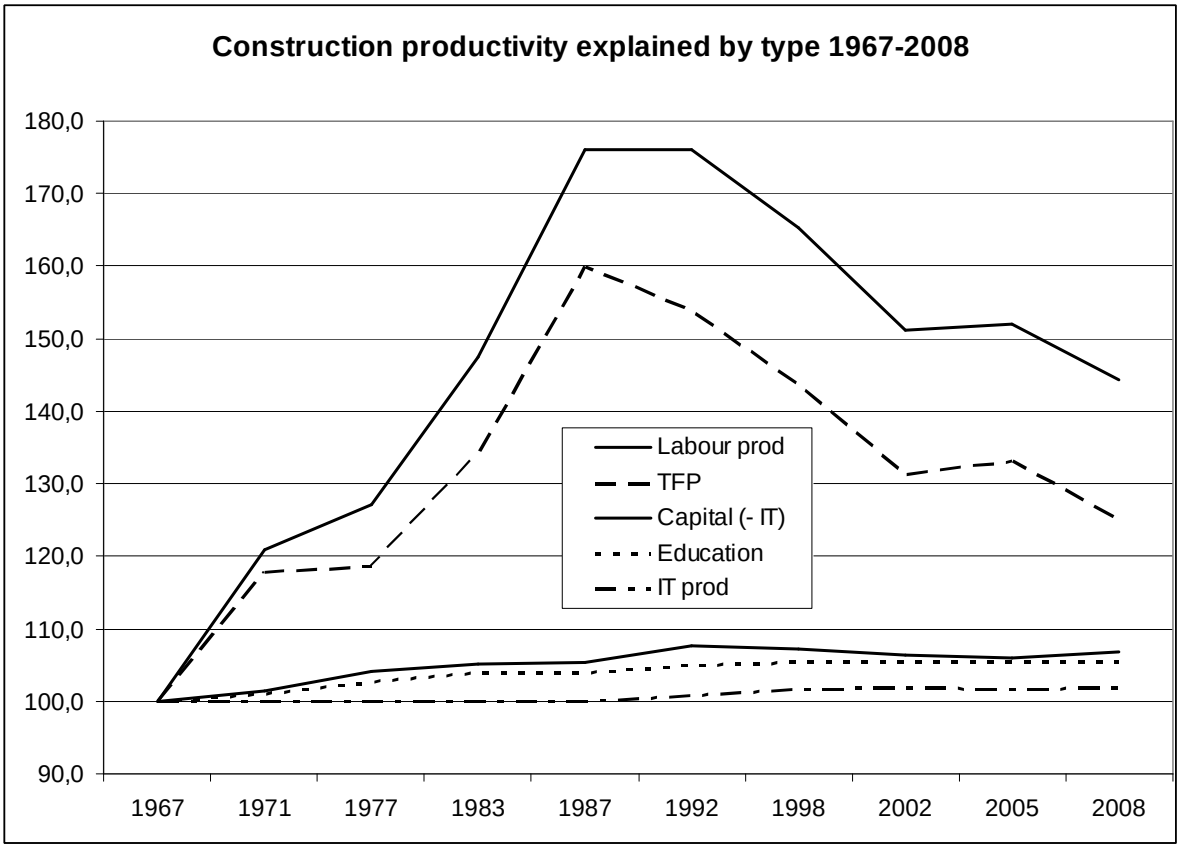
11 % is explained by investments in improvements of the education level of the work force, and

52 % is explained by the TFP (more effective leadership and management, new processes and general technological progress (not including IT) in society).

These figures are aggregated figures for the whole market based economy and must be seen as indicators of the general causes of the implemented productivity increase.

It is likely that the building industry deviates considerably and with the restrictions imposed by the limited information and data material, I will examine this in more detail. As seen in figure 5 below, the labour productivity (based on Gross Factor Income) is mostly explained by TFP, Total Factor Productivity (~Leadership and management and technological progress), while capital and IT investments, like investments in education do not matter much in the building industry.

Figure 5: Labour productivity in Danish construction.

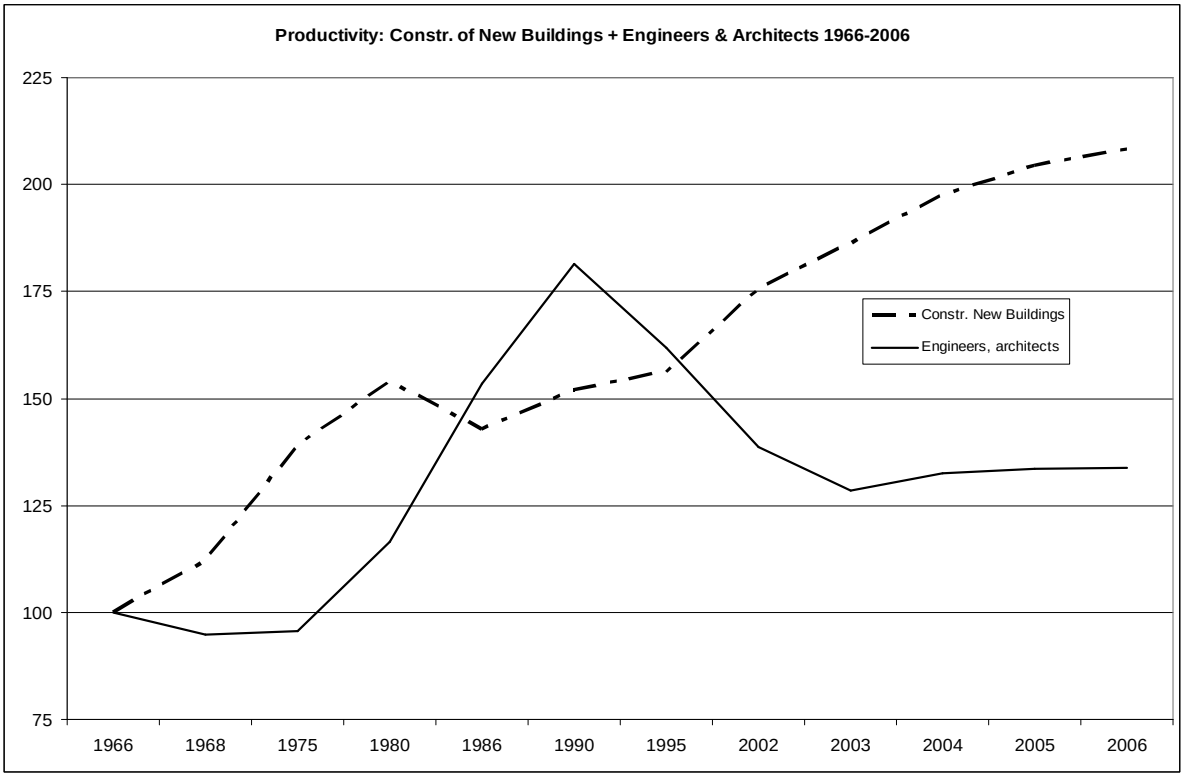


The causes are divided into and explained by four categories: TFP, capital, education and IT.
(Author's graph, 2011.Based on Danmarks Statistik, statistikbanken.dk, NAT 25, May 2011).

10.4 Capital plus IT Investments and productivity

As shown in the previous figure, capital investments in production machinery have largely gone past the building industry and have instead been made in the building *materials* industry. This capital investment in the building *materials* industry has reduced the amount of work performed at the building site, which logically ought to result in an increasing productivity in the building industry. When looking exclusively at the productivity for *construction of new buildings*, this is probably what moderately is reflected in figure 6 below.

Figure 6: Labour productivity in the construction of new buildings and by Engineers and Architects.



(Author's graph, 2011. Based on Danmarks Statistik, statistikbanken.dk, NAT 23, April 2011: Labour productivity by price unit, industry and time).

The figure above also shows an aggregated estimate of the productivity development for engineers and architects. The 'ruler and pencil' method peaked around 1990 and productivity has decreased since the introduction of CAD. Simultaneously, projecting became more complicated because of new building regulations with new demands on energy savings. But all in all, IT investments did not result in a higher productivity for the consultants in the building industry although the Danish consultants typically use the latest soft ware applications, while IT plays a significant role in creating productivity in the economy as a whole from the 1980s.

In section 3.5 it was said that 1/3 of the time used on the building site by contractors was spent trying to understand the drawings and project. What is it about digitization that could change that situation? The digital drawings have not become easier to understand and less bulky, quite the contrary - though they have been made available on the Internet. Furthermore, if you had difficulty reading before, digitalisation has only increased the amount of information, which probably is not helping - perhaps the contrary… Digitization typically moves the focus towards the human factor and stresses the importance of the degree of education of the workforce. Defects in most cases are the result of human errors, cooperation and operational errors - like in aviation, where modern aircrafts are 'flying computers' and the human factor presumably is the most frequent cause of errors and accidents.

However, it is in harmony with the research hypothesis that benefits from IT investments presuppose industrial production, the seller driven procurement model, well functioning leadership and management etc.

One of the industries that have benefitted most from IT investments is the graphics industry, which left the craft era, using the 'creative destruction' innovation method (Schumpeter 1942), abolished the craftsmen (typesetters) and obtained remarkable gains, but is now threatened by the virtual world (the Internet reducing the market share of printed newspapers, printed forms, advertising etc.). In a future Seller Driven Marketing Model, the idea of Taylor (1911) about substituting the knowledge of craftsmen with machines / computers might increase productivity in the building industry.

10.5 Industry model and educational attainment

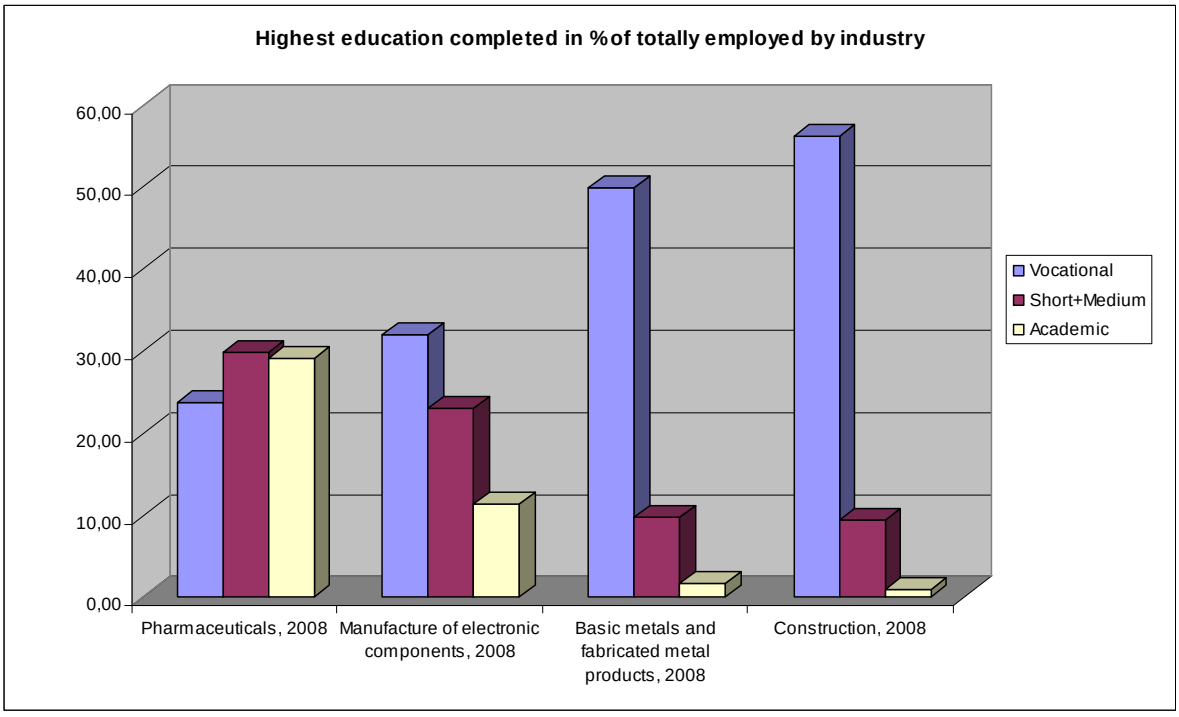
Investments in improvements of the educational level of the work force are often described as a prerequisite to increasing productivity. As shown in figure 7 below, the building industry clearly has the lowest educational attainment of the viewed industries. When comparing figure 4 and 7, it is remarkable that the level of education in the selected industries is proportional to the productivity of the same industries. A low proportion of high educated and academic manpower apparently results in a low-productivity development and difficulties in regard to change.

The high level of academic employees in the seller driven industries indicates a high degree of Research & Development in those industries. This

again is an indication that product development is likely to increase, once an industry has adopted the seller driven procurement model.

In regard to the basic metals and metal products industry, the high proportion of skilled labour is explained by the character of the industrialisation in that industry, which has specialized in the production of small series and niche production to e.g. the German industry, which requires skilled workers to program and operate the automatic and semi automatic production equipment, turning lathe etc. While the skilled workers in the metals industry use their vocational training to operate complicated machinery in a highly specialized industrial process, the skilled workers in the building industry still work as manual labourers in the old craft based building process.

Figure 7: Educational attainment in selected industries (highest education completed).



(Author's graph, 2011. Based on Danmarks Statistik, statistikbanken.dk, KRHFU2. April 2011).

My conclusion - the educational attainment in the selected industries is an indicator of productivity, where high education in the seller driven industries is a sign of a high productivity of the same industries. A high proportion of vocational educated personnel and a low degree of academics is attached to the craft era and a low productivity, which is in agreement with the research hypothesis.

10.6 Leadership and productivity

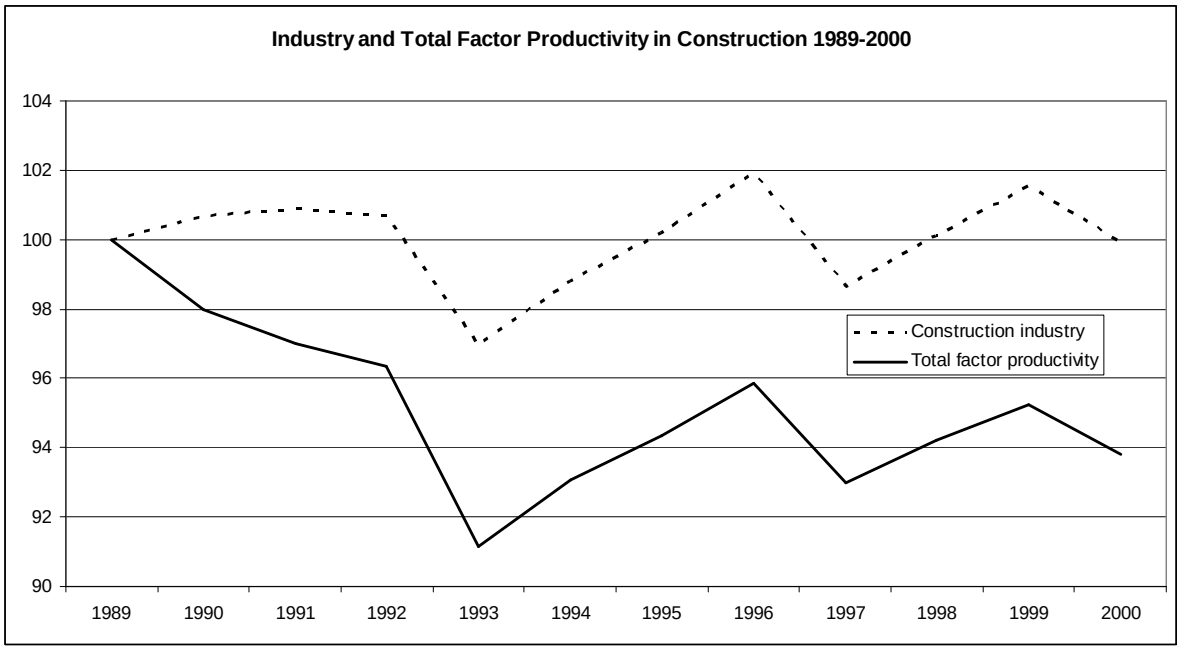
There has only sporadically been a focus on leadership and management as a tool to increase productivity in the building industry. The Leadership variable, however, was the variable *initiating* change in the other Danish industries together with the market mechanism of the industrial era. The model of change was simple; the new systems basically out-competed the old.

But how is it that leadership and management have had no effect in the Danish building industry and at the architect's office, when it was the main cause of change and productivity increase in the other industries?

In the total Danish market economy 52 % of the productivity increase (cf. chapter 10.3) was explained by the TFP (Total Factor Productivity = Better organization, new processes and general technological progress [not including IT] in society, in short more effective leadership and management).

It can therefore be argued that a strong connection exists between the increase in productivity and the use of effective leadership and management and general technological progress in society, as illustrated in figure 8.

Figure 8: The result of 'leadership (TFP)' is negative in the building industry.



(Author's graph, 2011. Based on: Danmarks Statistik 2004. Labour productivity in construction and the TFP).

However, the data (Danmarks Statistik 2004) shows a decline in productivity by minus 0.5 % per year in the building industry - *as the result of TFP*.

Also in this context the Building Industry is the odd man out: The construction productivity is stagnating and demonstrates a direct decline in

productivity as the result of 'leadership and management and general technological progress in society' by minus 0.5% per year. This is remarkable - not many industries have a negative development trend in relation to leadership and management and technological progress.

It appears that the typical connection between productivity increase and TFP, leadership and management and general technological progress in society, is not present in the Building Industry. This is practically ignored in the literature – **but is in total harmony with the research hypothesis**. The building industry is simply not ready to 'import' and use industrial leadership and management, because of the Buyer Controlled Procurement Model, craft production etc.

10.7 Productivity in the building industry, internationally

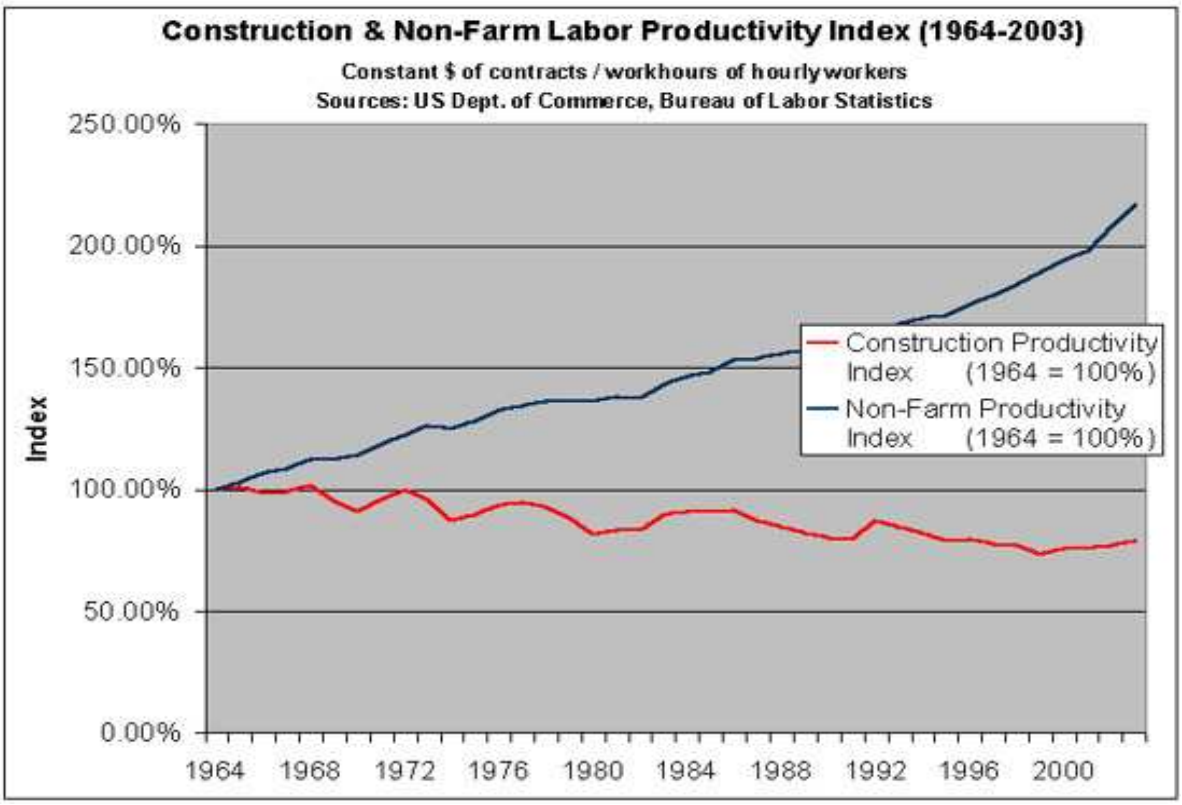
Productivity problems in the building industry are known internationally, and e.g. US construction productivity is on the decline according to Teicholz (cited by Picard (2004) and shown in figure 9 below, and according to Arditi &Mochtar (cited by Picard (2004) is demonstrating the same decline as in Denmark:

> "Systemic inefficiencies in industrial construction projects can no longer be overlooked in a competitive industry operating at low profit margins"…
> "In spite of cost control, planning and scheduling, design practices, quality control, prefabrication, information technology, craft training and safety – which over the years have been believed by the industry to offer opportunities for productivity".

Picard (2004) argues:

> "If construction would have achieved the productivity growth of the overall U.S. economy, labour requirements in 2001 would have been less than half what they were in 1964".

Figure 9: US construction productivity trend vs. the economy,
as measured in constant contract dollars per field labour hour. ('All Non-Farm Industry' includes Construction).

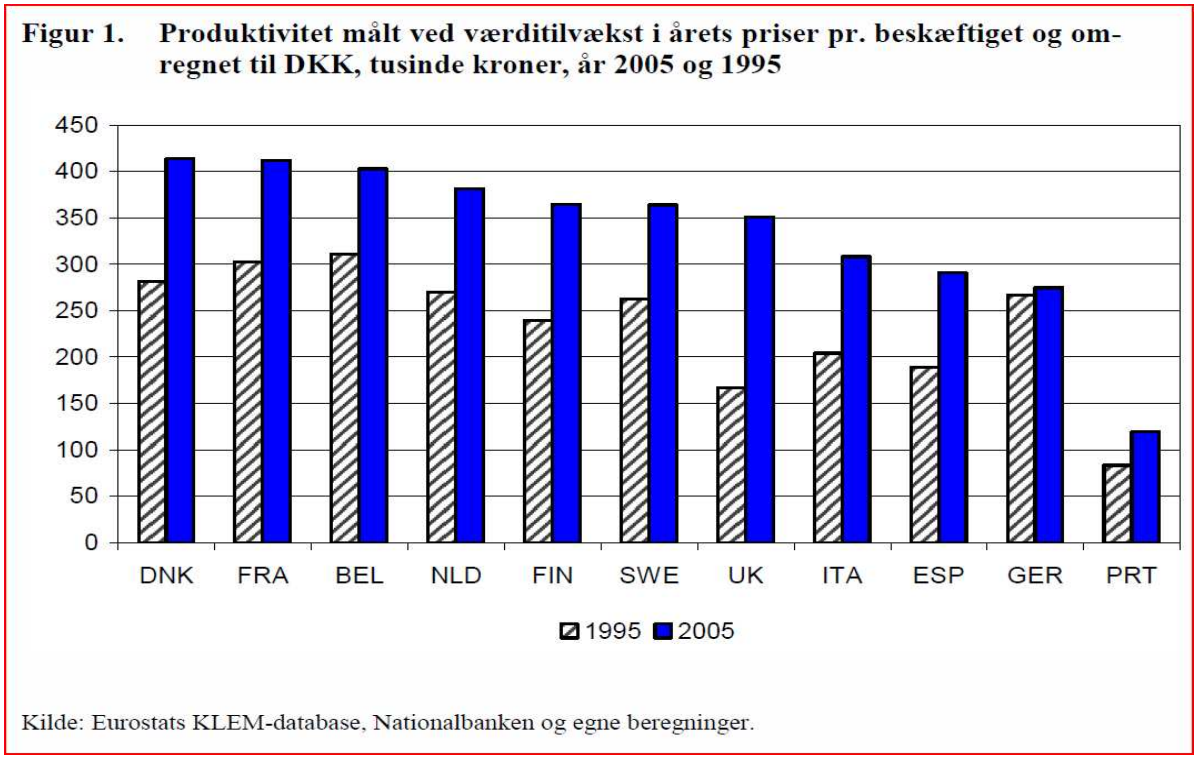


(Graph by Prof. emeritus Paul Teicholz, Stanford University, 2003. (cited by Picard (2004)

Comparison of construction productivity in 11 European countries

In order to evaluate the Danish construction productivity internationally, the Business and Construction department at the Danish Ministry of Business Affairs published a report (EBSt 2009) that compares productivity in construction in 11 different European countries, based on the Danish national accounts, the Danish National Bank, and Eurostat's comparable prices for construction. Value added per employee in construction in Denmark is the highest among the countries compared.

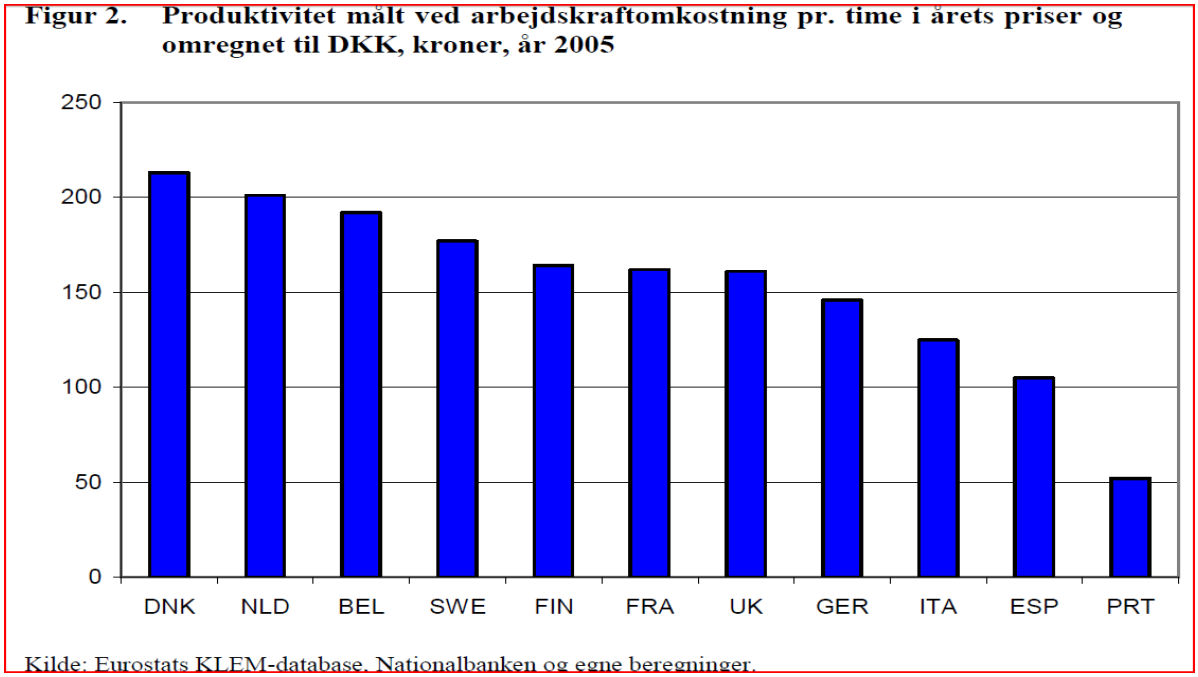
Figure 10: Productivity measured by value added per employee for the years 1995 and 2005 in DKK.



(Graph in EBSt 2009)

This high Danish value added may be due either to high productivity or high construction costs in Denmark. However, it is known that the price of construction work is relatively high in Denmark.

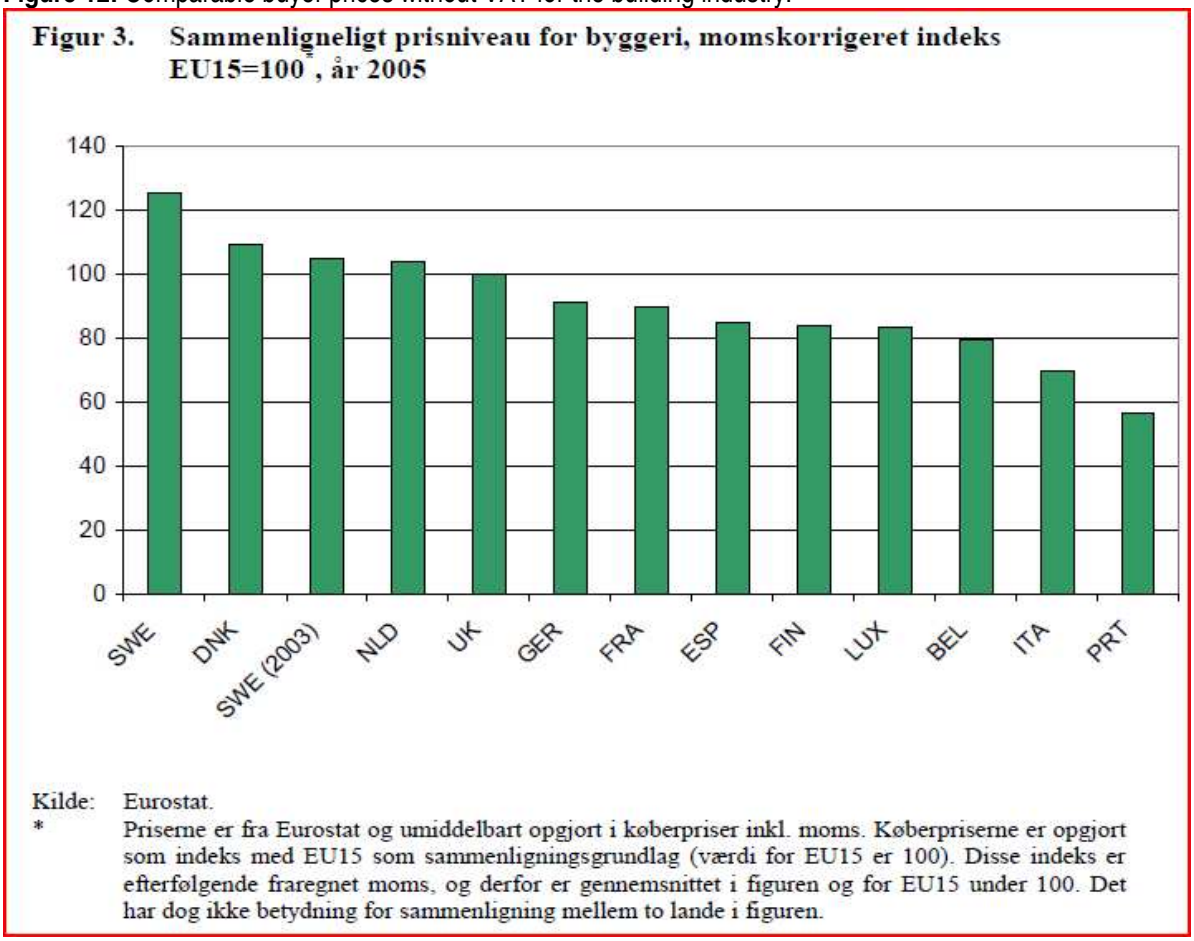
Figure 11: Productivity measured by the cost of labour per hour in 2005 prices (in DKK)



(Graph in EBSt 2009)

When Danish productivity ranks high in Figures 10 and 11, it may either be because employees in the Danish building industry produce comparatively more, measured in physical units (e.g. many square meters per employee.) or it may be due to the building industry's relatively expensive products in Denmark, which is shown in Figure 12, that is comparing construction prices for 2005. The figure is based on the price of "standard construction quality" in different countries, measured in national currencies.

Figure 12: Comparable buyer prices without VAT for the building industry.

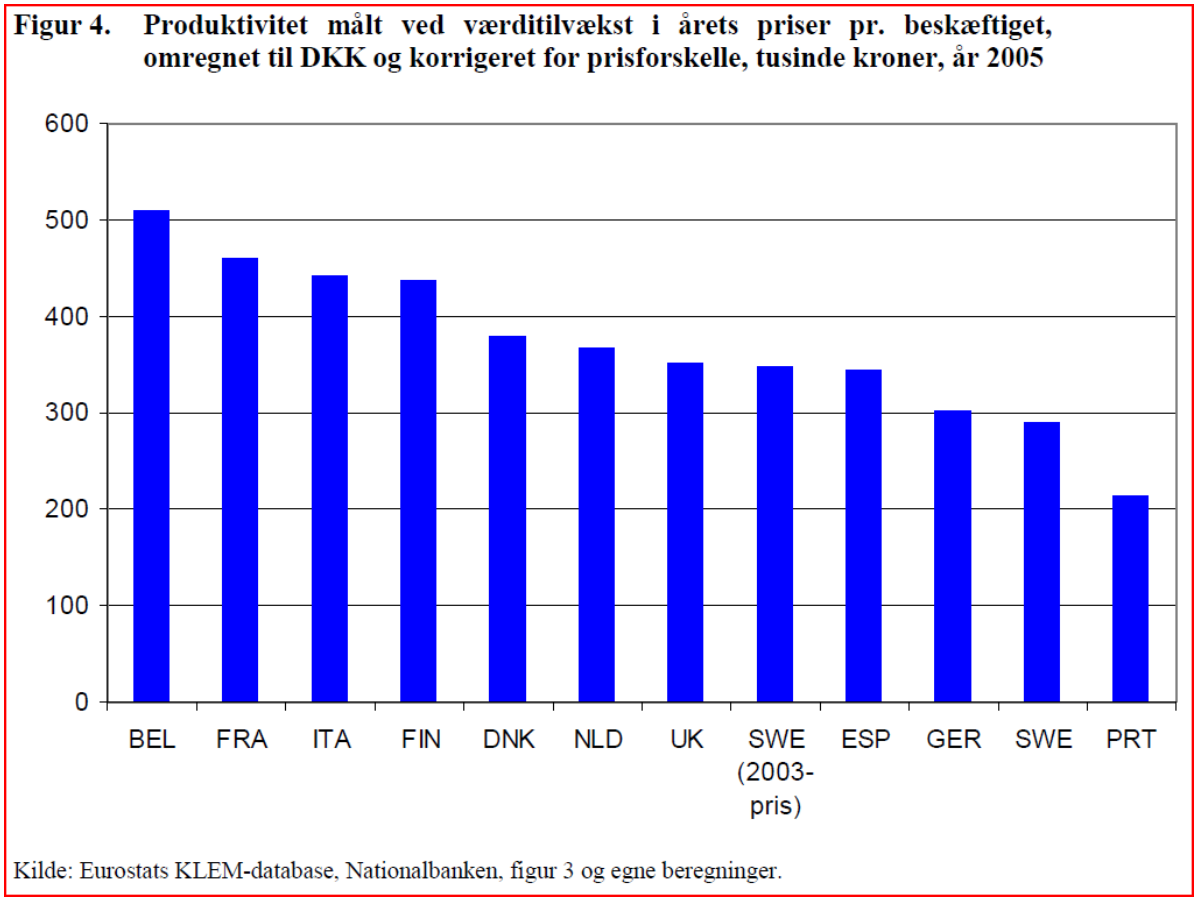


(Graph in EBSt 2009)

Because, in principle, the price of the "same" construction is measured, the different prices in practice should not reflect differences in quality of the construction in the different countries. Prices are then converted into the same currency with the general exchange rates so as to achieve a comparable measure of price levels in the compared countries. If a country in Figure 12 is represented by a 17 percent higher value than another country, it is understood that the cost of the same building is 17 percent higher.

When productivity in Figure 10 is corrected with the price differences in Figure 12, productivity estimates for the building industry in Denmark result in it being no longer among the top European countries, see figure 13. The Danish building industry productivity is now in the middle range, since a significant part of the high earnings per employee (see Figure 10) in construction in Denmark can be explained by the relatively high prices of housing in Denmark. E.g. in Belgium and France the prices of buildings are low, and productivity for these countries is therefore estimated among the top countries.

Figure 13: Productivity, measured by value growth in 2005 prices per employee.
Productivity, measured by value growth in 2005 prices per employee, converted to DKK and adjusted for price differences between the countries.



(Graph in EBSt 2009)

Productivity in the Danish building industry is in the middle range of the compared countries, so all in all, it appears that the problem with low building industry productivity is not only a local Danish problem, but rather an international problem.

10.8 Conclusion on productivity

The interpretation of statistical data with respect to level of negative or positive deviation (e.g. negative by 15% or positive by 5%) is not important for the research question addressed by this thesis. What is important is the level of productivity for the Building Industry - and the causes for this - in comparison with other industries. In this context the statistical information is unambiguous in that the differences are too big and consistent to be accidental, random or insignificant.

It appears that a fully informed basis to estimate productivity in the building industry does not exist. But when all reservations are taken, the impression of an outdated building process, which long ago reached the limit of its capabilities, remains as the lasting notion.

None of the strategies that were applied in the other industries have been able to work in the building industry, because the old building industry model is not compatible with those tools and not capable of working with strategies that are made for industries that are already industrialised.

All in all the statistical analysis, the surveys and data strongly indicate the nature of the problem and *confirm the research hypothesis*. The old craft-based building process and the associated business model have met the limits of its capabilities.

My study indicates that the buyer Controlled building industry is performing worse that the Seller Driven industries and that it is worthwhile to aim at transforming the building industry

11. Transformational approaches

This naturally raises the question: How is a 'locked', static system transformed to a dynamic new building industry that resembles other industries? Naturally this challenge can be approached in different ways. This problem is comprehensive and represents in itself a topic for further research. Therefore the subject is only briefly sketched here, in order to give an idea of the future direction.

The former attempts to transform the building industry have primarily been oriented towards rationalizing the product and production process. The imminent focus is more likely to implement a marketing oriented approach.

For the building industry and the architects, a future transformational process implies basically two things: First to de-learn the old culture and next learning to routine produce and design for industrialised production in a marketing oriented way, which probably brings along 'flexible, generic and prefabricated room size building units' that can be transported from the factory to the building site (Byggepolitisk Taskforce 2000), in order to minimize assembly work on site.

A shift in structural design from wall and slab elements to generic room-size units will promote the process, similar to a shift from 2D modular design to 3D room modules, which can be finished at the factory and only need to be assembled at the building site. Such generic units can in their basic structure be mass-produced and later be adapted for different functions and equipped with various façade solutions etc. to enable variation.
This implies an enhanced focus on the interrelated production and sale, which will enable the 'building project' to fade away and the 'modern business enterprise' with routine production to emerge.

To succeed with a future marketing approach, two things are vital: To establish a normal contemporary market with seller driven business enterprises, which are willing to satisfy customer needs and reduce prices according to the achieved productivity gains.

11.1 The market (the customers)

As seen, the market mechanism *on the one hand* does function in the present building industry, but in another way than in a seller driven market. The current market mechanism is marked by no or little productivity growth, modest earnings, and it is important to understand that competition is encapsulated in a pre-industrial tender contract model where the buyer determines the conditions of competition, which paradoxically results in a static situation with reduced development.

This buyer-controlled business model is characteristic of the function of the market mechanism and the regulation of competition in the pre industrial period, where it was customary for the buyer to commission and specify goods for future production and delivery; because there was no alternative.

But measured by modern standards (the Seller Driven Marketing Model that characterizes most of the other industries), it is *on the other hand* true that the competition in the building industry is far from effective. It does not separate the good enterprises from the bad and it does not result in lower prices. For example a PC 30 years ago did cost a fortune and had limited functionality; today a new one will cost a fraction of that price and yet it has an incredibly increased functionality. In the building industry the reverse is true, which makes it socially unsustainable to turn the blind eye to the underdeveloped building industry (Picard 2004).

Obsolete legal market regulation

The market in the building industry, quite deliberately, is legally regulated in the manner that was standard in the pre-industrial business environment. Because the client legally and formally is one of the parties in the building process (Iversen 2005), by heading the process and specifying the work, by selecting and 'employing' consultants and contractors and assuming responsibility for security on site, for assuring the legality of the construction etc., it is tradition that the client's acquisition of the building is not regulated by law. Construction is for example not covered by the Sale of Goods Act that otherwise governs the modern relationship between seller and buyer), but governed by voluntary agreements. Disputes over the contracts are settled by case law (based on ‘contract law’, the ‘General Conditions AB92’, etc.), and arbitration.

However, the regulation of the competition is known to be mandatory for projects involving all public clients, cf. the Danish Act of Tenders and the EU Procurement Directive. When these mandatory rules regulate e.g. the construction of a hospital, this takes place 'on top of' a business model that is already buyer controlled. This is not the case with the purchase of equipment, etc. to the hospital, where the directive also applies - and it does all the difference. The buyer of the equipment has no leadership role in relation to the production of the equipment, such as the client in the construction of the hospital. The purchaser of the equipment is just buying industrially produced products from seller-driven companies, using a tender process. The client rarely is able to fulfill his tasks in the old building process and the associated business model is 'incompatible' with society's dominant norms and roles, which does not speak for the preservation of the Buyer Controlled business model.

11.1.1 Opportunities for a transformational process

In contrast to this obsolete public regulation, it would be possible for the government to *'plan'* the transformation to a new mode of production and management in the building industry, if the government was involved in the process, instead of waiting for the industry to do the job. A reorientation of the subsidies to housing, away from interest deductions for new homes on the tax records, in favour of support for the development of seller driven industrialisation might be a possibility. A part of such a plan would also be a reorientation of the educational system, introducing the new building industry model, together with a de-learning programme for former employees.

11.1.2 Target segments for a transformational process

Some market segments will be more suitable to begin the transformation and industrialisation process than others: Construction of new buildings is probably more adequate than refurbishment and renovation, see table 16.

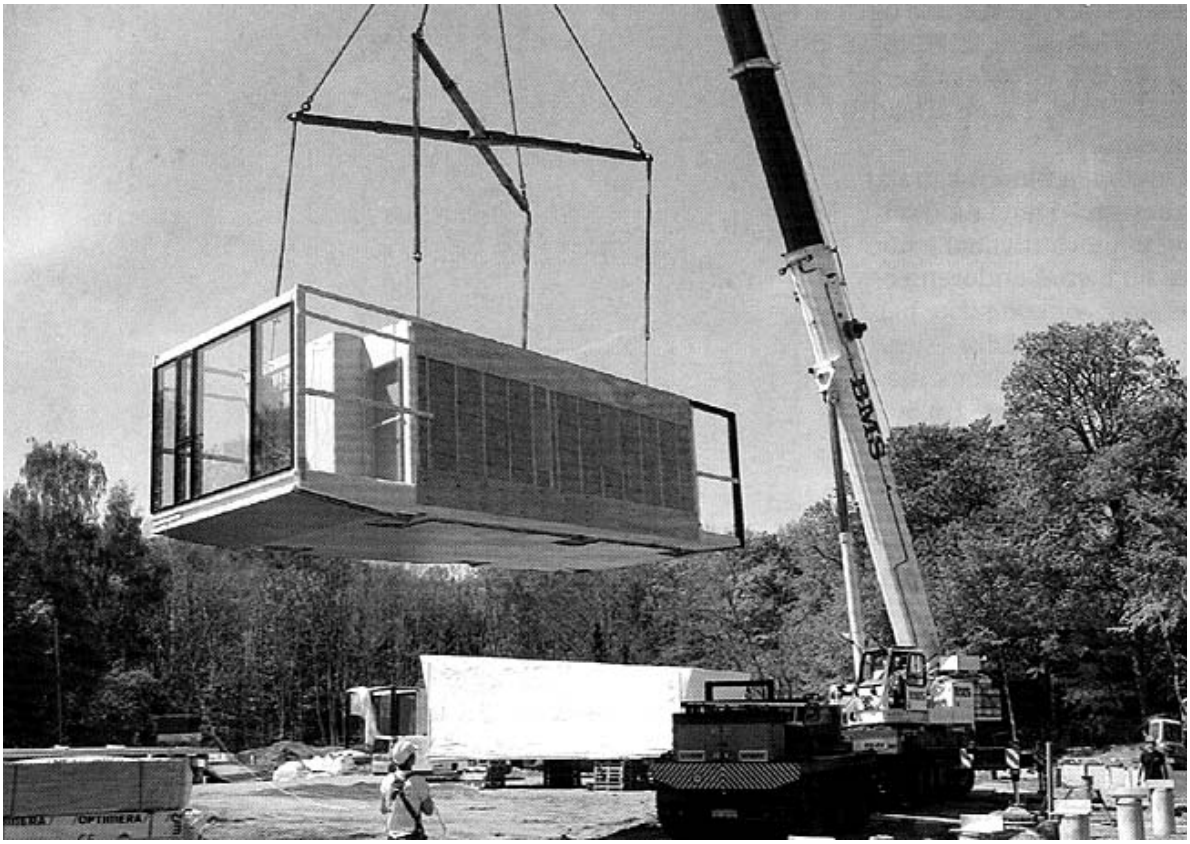
A legal barrier in regard to public buildings naturally deselects all public buildings and social housing, which has to follow the same mandatory legal regulation.

Table 16: Coarse Segmentation of the market

Segments	New buildings (~ 40%	Operation & **maintenance** of buildings, **refurbishment**, and **renovation** (~60%)
A. Housing, **small** buildings	One family houses. Terraced houses. Co-operative housing.	Many small assignments. DIY.
B. Housing, **large** buildings	Social housing. Private apartment buildings.	Facilities Management. Large renovation assignments.
C. Buildings for **small** business enterprises.	Service buildings & retail shops. Craft & industry. Agricultural buildings.	Many small assignments
D. Buildings for **big** business enterprises and public authorities.	Production buildings Company domiciles. Shopping centres. Public buildings.	Facilities Management. Big renovation assignments.

But detached family houses, terraced houses, and co-operative housing would be suitable for industrial production, using prefabricated room-size units without the old problem of the first industrialisation wave of the 1960'; The monotonous design of the houses.

Figure 14: Room-size unit for Hotel Rungstedgaard north of Copenhagen.



(Picture, 2011. From 'Byggeri' No 5 2011 p. 8).

In each of the private segments there are likewise building types with a high rate of repetition, e.g. hotels with a high frequency of identical rooms, which are suitable for industrial production as room-size units as shown in figure 14.

11.2 The supply side

The biggest productivity increase is expected to come from substituting work at the building site with work in a controlled environment at factories, introducing a new industrial production process. But in order to increase productivity, the design process, the function and form of the building and the structural design must be arranged and prepared for industrial production. The aim should be to integrate the design and production process by including considerations on how to industrially manufacture the outcome of the design process.

As it was shown previously, the present learning process in the building industry results in 'destructive learning' (see section 3.1) and therefore it is vital to establish a new environment based on constructive learning to enhance productivity. In principle this can be done in three different ways: Either by establishing new companies with new employees without the old destructive baggage to implement the Seller Driven Marketing Model and the industrial routine production; by the existing firms and employees who have to 'de-learn' the old culture and building process, or by a combination of the two.

11.3 The connection between knowledge and leadership

Every transformational process is by nature on the one hand a process of getting rid of the old practice, the old ways of thinking and attached conceptual formations and on the other hand a process of learning the new practice and the new ways of thinking.

So the transformational process in the building industry is not only a process of learning, in fact it begins with the 'creative destruction' of obsolete knowledge and practice, according to Schumpeter (1942). He described a process where:

> "The opening up of new markets, foreign or domestic, and the organizational development [...] illustrate the same process of industrial mutation that incessantly revolutionizes the economic structure from within,

incessantly destroying the old one, incessantly creating a new one". He called this process "creative destruction".

One important insight arising from Schumpeter's ideas, though, is that innovation can be seen as "creative destruction waves", which restructure the whole market in favour of those who grasp discontinuities faster. In his own words:

> "the problem that is usually visualized is how capitalism administers existing structures, whereas the relevant problem is how it creates and destroys them" (Schumpeter 1942 p. 84).

Any change involves a risk of making mistakes and in this connection, the industry might learn from the experience of other industries, see table 17:

Table 17. Anticipated 'dangers' to the transformation process**:**

			Organisation & leadership:
		Production mode:	**From**: Building process leadership around the client. **To**: Marketing oriented leadership and management of the business enterprise supplemented with project management. **Danger:** Project Management orientation instead of leadership and management of the business enterprise.
	Buyer perception:	**From**: Building projects. **To**: Unified production as routine operation in a business enterprise supplemented with projects. **Danger:** Production orientation. Too much focus on the production process – too little on marketing.	
Business model:	**From**: Client. **To**: Customer **Danger:** To think like a client instead of marketing oriented.		
From: Buyer controlled procurement. **To**: Seller driven marketing oriented procurement. **Danger:** Only partial transformation. E.g. applying the Seller driven marketing model, but skipping industrialisation and continue using the old building process which is unable to provide lower prices.			

11.3.1 The new learning process

Furthermore this implies that every transformational process is a complex affair, which characterizes the frequent changes in modern society. The guiding principle for changing a complex social system, such as the building industry, may be: Through learning. Complexity is handled by the means of knowledge and knowledge is obtained through learning, according to Qvortrup (2001 p. 10). Using the systems approach to knowledge, *leadership and learning through knowledge become nearly synonymous concepts* in a hyper complex society (Qvortrup 2004).

This resembles the situation Taylor described in 1903, when he 'moved' the knowledge from the skilled workers to the machines and the industrial process. The approach to (and the way we handle) knowledge becomes the key factor.

What exactly is knowledge?

In modern society there is a tendency to mistake man's abilities for knowledge, according to Qvortrup (2004 p. 111). What we are able to do is not the same as what we know. Apart from what we *know*, there is a tacit dimension. The accumulated abilities of human beings can be split into:

- **Skills,** which are unconscious abilities, such as being able to recognize a face or use a planer to shape a piece of wood. Once you have learned the skill, you do not think more about it and you cannot explain how you learned it, or exactly what you are doing; it is a kind of tacit knowing (Polanyi 1967).
- **Knowledge** is a reflected ability, an approach to handling the complexity of the environment.

We know by now, that in the building industry there has to be a change of focus from 'skills' in the old manual craft production to knowledge in the present hyper complex society. For this purpose there is a need to further develop the concepts of knowledge and leadership and analyse the connection between them.

Knowledge according to Qvortrup (2001) is thus defined as the way the complexity of the environment is handled ('~leadership has to do with adapting the internal complexity – 'the organization' - to the environmental complexity'). Knowledge is used to *transform uncertainty to certainty by categorizing*

phenomena to, what is already known. But also to add a 'form aspect' to uncertainty and thus convert it to something that can be taken care of - in order to develop the strategies for handling the uncertainty.

In this way knowledge becomes the relation between the internal complexity (e.g. the organization of an enterprise), which can be externalized in the shape of e.g. machines and technology, and the environmental complexity, a relation which very well resembles the definition of **leadership** in section 8.2.

A decisive characteristic of knowledge is its *dynamic feature*, which enables it to interact with the external environment and thus lead to new knowledge. This is called '**learning**', which both is an individual and an organizational process. Qvortrup (2001) distinguish between the following types of knowledge, see table 18:

Table 18: Knowledge types

Bateson's types of knowledge	**Types of stimulation**	**Types of Results**	**Types of proficiency**	**Output effects Learning types**
1. order **Factual** knowledge	Direct stimulation. Ordinary teaching	Qualifications	Factual knowledge	Proportional effect
2. order Situational knowledge	Appropriation Project work	Competence	Reflexivity	Exponential effect
3. order **Systemic** knowledge.	Production Building a new type of house, or writing a new paper	Creativity	Meta reflexivity	Quantum leap Innovative learning
4. order Knowledge of the **world**.	Social evolution	Culture	A general education.	A shift in paradigm

.. which Qvortrup (2004) further develops in figure 19 to..

Table 19: Knowledge potentials (Author's translation and adaptation)

Types of knowledge	Knowledge terms	Knowledge potentials
Factual knowledge (~what Plato called 'episteme' / ~knowledge) ..in combination with ..	**Qualifications** Practical skills / proficiency. (The knowledge we use to answer questions beginning with: Who, what, where and when).	What you know that you **do** know. The ***inductive*** knowledge stock.
Situational / reflexive knowledge. (~Plato: Doxa / ~opinions)	**Competences** The ability to use ones qualifications in changing situations. (Questions beginning with How?)	What you know that you **do not** know. The ***deductive*** knowledge potential.
Systemic knowledge. Knowledge about the knowledge system. (~Plato: Sophia / ~wisdom)	**Creativity** The ability to understand the knowledge system itself in order to modify the paradigm you work within and to manage 'de-learning'. (Questions beginning with why?)	What you **do not** know that you know. The ***abductive***[15] knowledge potential.
Knowledge of the world Knowledge about the premises of the knowledge system. (~Plato: Metaphysis / ~the divine)	**Culture** Understanding culture or what you must practice when you lead a 'learning organization'. (Epistemology – theory of knowledge)	What you **do not** know that you **do not** know. Non-knowledge in the borderland of knowledge - with potential for a paradigm shift.

One type of knowledge is not 'better' than the other – the one presupposes the other. (The comparisons with Plato's concepts are only used to describe the differences to the traditional theory of knowledge).

Out of the four knowledge types, the systemic knowledge, *resulting in creativity and innovative learning* seems of special relevance to the building industry.

[15] See Appendix C1

Part IV. FORECASTING FUTURE DEVELOPMENT SCENARIOS OF THE BUILDING INDUSTRY

"Fortune telling is difficult – particularly concerning the future…" (Danish saying by Robert Storm Petersen, 1882-1949)

12 Methodology considerations

In the previous chapters, I have described aspects of the building industry's past and present, and I have compared the industry's progress with that of other contemporary, but industrialised industries. By focusing on the differences and by using the same variables, I have established two archetypes or industry models, which characterize, respectively the old building process and the foreseeable industrial alternative.

Thus, having considered the past and present, and although it is likely that the research hypothesis is logically acceptable, it may be instructive to look into the prospects of the future, seen from the perspective of 'building industry experts'.

What is their vision of the future development of the building industry? Do they understand and accept the new building industry model?

The aim of the enquiry is to get some response on my analysis of the possible future of the building industry from 'experts' in the industry, to get an indication of whether there is a sort of consensus on the future development, or simply to get an indication of the major points of view on the matter and preferably in relation to the research hypothesis.

12.1 Different possible approaches

To investigate this, 'asking some experts' is required and several methodologies might be applicable, each with advantages and disadvantages according to Walliman (2005) and Flick (2007).

Gathering this kind of primary data might e.g. involve a **Questionnaire** survey, which is one of the most commonly used approaches. Questionnaires are suitable for a large number of respondents, but the analysis of the data collected might be very time consuming.

The questionnaire design and the formulation of the questions, which generally can be either closed with fixed response options that typically are ticked - or open questions, enabling the respondent to more freely express his opinion on the question asked - or a mix of the two kinds of questions. If the questionnaire has too many questions, some respondents might reject answering. This method typically does not allow for interaction among participants, as they usually are promised anonymity and do not know each other's responses.

Interviews and conversations are especially suitable for investigating problems in depth, involving people's emotional point of views of different aspects of the problem and in cases where it is important to observe the person during the session. They are however time consuming in themselves and it is not easy to make appointments with fairly busy people. The method only allows for interaction with the interviewer.

Focus groups consisting of 'selected people, meeting around a table' are suitable for confronting a group of people with one or more well defined options such as e.g. product designs. The focus group comments on what option, the group prefers. Often used as a basis for decision. The method allows for interaction between participants. However, very often it is difficult to arrange a meeting, where all participants are willing to attend.

Interactive forecasting methods / Group consultation / Delphi panel
These methods are among other purposes designed to forecast the future by asking a group of experts about how they see the future.

The panellists are invited to participate, informed about the method in short and only those who accept the invitation get to answer questions.
The method enables interaction between participants either through arranging a meeting, where they influence each other, but it is usually difficult to collect experts together in one location. Or through a series of questionnaires / open discussions of selected questions by mail or e-mail, which appears to be a relevant alternative.

Selecting the most suitable method.

In regard to my survey, *all the inquiry methods have drawbacks*, see 13.3.1 and 14. This becomes evident if we look at some examples from the past. The present parties and actors in the building industry are not necessarily to continue in the future building industry, cf. Schumpeter's (1942) 'creative destruction', innovation theory and it must be borne in mind that e.g. the shoemakers in the old craft era did not all continue as employees in the new shoe factories. If one, years back, had invited various specialists in the shoemaking craft industry to a Delphi panel to discuss the development of the industry, it is far from certain that the outcome would have pointed to what became the future... The same applies to the typographers 30-40 years ago. They had the strongest unions, but did not look towards the future and were totally wiped out, surprisingly rapidly. There is no guarantee that any inquiry method would have predicted this outcome.

But to ensure a future oriented discussion of the questions, and a method which enables some kind of *interaction* between the participants, the choice is between a Focus Group and a Delphi Panel Consultation, see table 20.

Table 20: Overview of advantages of different qualitative data collection approaches:

	Problems in depth and emotions	Closed and open questions allowing free answers	Decision making	Forecasting the Future	Interaction between participants
Questionnaires		✓	✓	✓	
Interviews and Conversations	✓	✓	✓	✓	
Focus group meeting			✓	✓	✓
Delphi Panel Consultation		✓	✓	✓	✓

Because it proved impossible to gather all experts around a table, the choice fell on a *Delphi Panel Consultation, conducted by e-mail* and controlled by me.

The Delphi method via e-mail also provides the opportunity subsequently, depending on the first responses, to subdivide the respondents into different categories, and the necessary time from there to ask new detailed questions, see e.g. section 13.2.1. That might not be possible at a roundtable in the form of a focus group.

12.2 The Delphi Panel Consultation

According to the Rand[16] Corporation's webpage,

> "RAND developed the Delphi method in the 1950s, originally to forecast the impact of technology on warfare. The method entails a group of experts who anonymously reply to questionnaires and subsequently receive feedback in the form of a statistical representation of the "group response," after which the process repeats itself. The goal is to reduce the range of responses and arrive at something closer to expert consensus. The Delphi Method has been widely adopted and is still in use today".

According to Dalkey (1967),

> "Delphi is the name of a set of procedures for eliciting and refining the opinions of a group of people. In practice, the procedures would be used with a group of experts or especially knowledgeable individuals".

The method is used in the context of what Dalkey (1967), who is one of the founders of the Delphi method, calls "the Advice Community" and it is a technique for refining the practical outcome of group consultations. "..If you interrogate several equally competent individuals, you are likely to get a divergence of answers", which is not a very useful advice to act on. But on the other hand uniformity ".. is obviously not a defining characteristic, since uniformity of response does not guarantee the solidity of that response".

To guarantee uniformity, the simplest method is to select only one advisor, but this is clearly "fraught with danger" to be led astray by the advisor's personal opinion. Another method "is to involve several knowledgeable individuals and employ some method of group interaction to arrive at a common opinion", e.g. to set up a committee or commission", which has several drawbacks. For example the group is likely to be highly influenced by those who do the most talking, by group pressure that puts a premium on

[16] RAND is short for research and development. The RAND Corporation was founded by Douglas Aircraft in 1946, but is an independent research institution today, partly funded by the US government. www.rand.org

compromise, and irrelevant or redundant material, known as "noise" that obscures the debate and material, directly relevant to the topic discussed.

> "The Delphi procedures have been designed to reduce the effects of these undesirable aspects of group interaction" (Dalkey 1967) by ensuring *anonymity* to reduce the effect of the socially dominant individual. Interaction between respondents is conducted through channels controlled by the facilitator both when written questionnaires and on line computers are used, *controlled feed back* to reduce noise, and *Statistical "group response"* to reduce group pressure toward conformity. "Thus there is no particular attempt to arrive at unanimity among the respondents, and a spread of opinions on the final round is the normal outcome". (Dalkey 1967)

In the current study the Delphi survey is not being used as the basis for decision making, but as a forecasting technique to provide an indication of whether there is consensus on the future development, or simply to get an impression of the major points of view on the matter and if possible in relation to this thesis.

13. Analysis of the Delphi Panel Consultation

Background…

It is understandable that the uncertainty about the future is considerable in the building industry. According to Liliegreen (2000), the Danish building *sector* employed about one out of four in the Danish private sector in 1992. This makes the building sector[17] very important for the employment figures and for that reason, the sector is used to being subject to political control and to depend on political 'rescue packages' to sustain employment and earnings. This is once again the case, now with a background in the current international financial crisis.

10 years ago the then left-centre government prepared an intensified effort to finally industrialize the building industry, with the objective to seriously cut (‘halve’) cost prices and construction time (Boligministeriet 2000). Both contractors and consultants joined the government's objective and initiative. In 2000 the minister of Business Affairs, Pia Gjellerup said:

> “The Ministry of Business Affairs (Erhvervsministeriet) has therefore put significant effort into the program 'Process and Product Development in the building industry (PPB)'. [...] The study shows that the quality in construction is declining and is characterized by a poor productivity performance...
> We need a relevant and inspiring debate on the need for policy initiatives. The debate should provide the basis for the government's targeted efforts to increase productivity and improve quality [...]
> We will back the building industry with a process that in the coming years will enable us to build both better and cheaper through the development of processes and products”. (Blegvad 2000 foreword- in Author’s translation)

But with the shift to a right-wing government in 2001, this objective was abandoned and left to the industry itself. Without the government as a unifying factor the industry once again has proven to be too divided to agree on a capable future strategy.

The pressure was relieved on the contractors, who had the closest ties to the government (Kristiansen, Emmitt and Bonke 2005) and instead put on the consultants, who were now under pressure to invest in a digital design process,

[17] The building sector includes the building industry, various consultants, raw material manufacturers, building material manufacturers, retailers of building materials, etc.

placing working drawings onto a Web portal, where all actors with a password can download the project material, drawings etc. Furthermore they had to prepare organizing invitation for tenders through this web portal.

In the current situation, all actors await the impending (autumn 2011) general election. Opinion polls have for some time suggested a new left-centre government and in the building industry this both adds to the uncertainty about the future direction and the actors' ability and will to speak about the future. In recent years, the battle lines between the well known development directions have not moved significantly, and a visibly and widespread fatigue affects the industry, both because of the financial crisis' impact on demand and because the players are accustomed to relating to political initiatives about the future direction from the government and those initiatives await the outcome of the election.

The major developers and contractors have suffered heavy losses on residential projects and several banks have succumbed, because developers could not repay their loans. One of the major contractors, Skanska, has withdrawn from the Danish market on the grounds that it was impossible to make money in the Danish construction market. Therefore the players are ill prepared to discuss the future, while the discussion on the other hand will be more interesting, because the opportunities for structural, systemic changes are present. But that discussion is of course difficult.

13.1 Selecting the Delphi Panel

The panel members have been selected on that background, trying to find panellists, who both have expertise knowledge and are willing to express their opinion. The idea was to have represented advocates of the above-described two political strategies as well as neutral observers.

Panel members:

A. A Professor from The Copenhagen Business School, CBS. (Organization and management). Is privately funded by a fund for the build environment. (My pre-assessment: Probably supports the present government's strategy of slow development. Supports 'endangered species' like the 'architect as an *artist*')

B. A Senior consultant, constructing architect from the Organisation of Constructing Architects (Konstruktørforeningen) with the responsibility to follow the development of the building industry.
(My pre-assessment: Is known to be fond of the old craft era and its culture, but not directly against industrialisation. ", most of the tasks to be performed in construction, require professional craftsmanship. Not a higher education" and he does not find that productivity will increase with higher education (Ravn 2011).

C. One of the directors of the Organisation of Contractors (Dansk Byggeri).
(My pre-assessment: Probably supports the present government's strategy of slow development, but is likely to support industrialisation, if the government sets up a strategy plan with sufficient funding).

D. A Lecturer, The Danish Technical University, DTU (management) running a master course on Construction as an industry and the future of the Building Industry.
(My pre-assessment: Neutral - leaning towards industrialisation).

E A Retired civil engineer. Former partner in one of the big Danish Engineering Firms.
(My pre-assessment: Probably neutral - but leaning towards industrialisation. Is a well known advocate for lean construction principles).

F The Sales director of a building materials company producing building systems. (My pre-assessment: Probably neutral).

G A Managing director of one of the biggest Architect offices.
After having accepted to be a panellist and having received the first questionnaire, he answered "I must unfortunately confess that the questions do not address areas that I hold any knowledge about" and he found that his answers would not be valid.
It is a problem that most architect firms are not concerned with industrialisation, productivity etc. Therefore, he was replaced with 'B'.

13.2 The survey

The survey consists of a preliminary questionnaire, followed by a few subsequent, open questions to enable interactive debate. (See annexes in appendix B p. 171).

The purpose of the preliminary questionnaire is to determine the general starting point, enabling a description of the development in the discussion (if any).

The subsequent, open questions should connect to the problems in my thesis, which require some introduction to be comprehensible.

(To secure anonymity all communication with the panel was conducted by e-mail through me in Danish, and questions and replies used in this analysis have been translated by me.)

13.2.1 First round: Analysis of the answers to the preliminary questionnaire:

The answers (ranging from 1-5) are typed into a spreadsheet, in order to calculate the median, and sums up which answer gets the highest score etc. On this background, I have given feed-back to the panellists and asked new questions (see appendix B p. 176).

The first question *('How do you assess the current building sector's opportunities to improve its problems concerning productivity, defects and client and user satisfaction?')*. The replies to this question should provide an indication of, whether the present industry is able to remedy its problems, or whether more structural changes are to be expected. A critical approach implies that since the last 40 years has shown only little improvement, cf. chapter 10, there is limited hope that the same processes and structures will lead to positive changes. But nevertheless the median answer is 4, indicating that the industry will be successful this time. "C", who knows the building industry from within, is more modest with a neutral mark of 3, like F.

Only "D" is sceptical with a mark of 2, about the current sector's potential in this respect - he has taught in and studied this subject in detail.

The second question (*'Is the building industry in terms of* ***industrialisation*** **and** ***management*** of the old building process *able to keep up with develop-*

ments in other industries of a similar size?'). All the literature indicates that the building industry up till now has had a major problem with management and to follow-up on the first industrialisation wave in the 1960's.

The median answer is 3. Again only "D" is sceptical with the mark of 1.

The third question *('Do you foresee changes to the existing professional* ***boundaries*** *and* ***mergers*** *of companies involving different disciplines?')*. The Danish building industry has had rather rigid professional boundaries and many small enterprises; while most industries have experienced frequent company mergers and the undermining of old boundaries.

The median answer is 4 and again only "D" deviates with a low mark of 1. He does not foresee changes in this respect, which is in harmony with his previous answers. The rest expect changes in trade boundaries and mergers of companies.

After the first three questions we have two perceptions of the future: *The majority* expects the present building industry to develop and remedy its problems, e.g. by changes of boundaries and mergers among the existing enterprises – the 'traditionalists'.

A minority of one panellist however, do not believe in the existing industry's ability to remedy its problems, industrialize and improve management and break with professional boundaries and the enterprise structure – the 'experienced innovator'.

The fourth question (*'Which* ***development strategy*** *should the building industry follow*?')

The questionnaire contains 3 strategies hidden in 10 possible answers:

I. A **slow, gradual industrialisation** of the present building industry - the strategy of the traditionalists. (Increased use of prefabricated elements, IT, improved communication and collaboration, borrow from other industries, lean construction, reduce craftsmanship, the educational system). Represents the Buyer Controlled Procurement Model.

II. **Innovative industrialisation** - the strategy of the experienced innovator. (Establish new integrated, industrial companies with integrated design, production and marketing…). This strategy represents the Seller Driven Marketing Model.

This strategy has the potential for external actors to establish themselves in the segment of construction of new buildings. New investors and employees have the advantage that they do not have to start with a de-learning process.

III. **Continue unchanged** - the pure conservative strategy. Represents the Buyer Controlled Procurement Model.

Five panellists replied before de dead-line - "F" was too late. Therefore the panellists received feedback based on 5 replies. Ordered according to the highest score (replies including the 6th panellist is shown in brackets), the priority of the panel is:

1. (1) - 4.2 Continue unchanged, but increased use of IT - Revit, BIM, Sharing of drawings etc. on the Web.
Score = 16 (16), Median= 3 (3).

2. (3) - 4.3 Continue unchanged, but improve communication and collaboration (e.g. fixed cooperation constellations).
Score = 14 (14), Median = 3 (3).

3 (3) - 4.1 Continue unchanged, but with an increased use of prefabricated building objects etc.
Score = 12 (14), Median = 3 (2).

4 (2) - 4.7 Gradual value-optimization of the production through e.g. Lean Construction principles.
Score = 10 (15), Median = 3 (4).

4. (5) - 4.6 Establish new integrated, industrial construction companies with integrated design, production and marketing that are able to harvest the rationalization gains, and who are able to produce for *unknown customers*, like other contemporary companies.
Score = 10 (11), Median = 4 (3).

5. (4) - 4.9 The educational system will gradually 'industrialize' the content of higher educations and subsequently in the building industry.
Score = 8 (12), Median = 3 (4).

6. (7) - 4.5 The building industry should learn and 'borrow' from other industries (knowledge about production and management, etc.)
Score = 4 (7), Median = 4 (4).

7. (7) - 4.4 Continue unchanged.
Score = 1 (1), Median = 1 (1).

The rest had no score at all.

There is no agreement on the future development strategy, but based on these replies, the majority points first to the strategy of the traditionalists (all replies but the 'Integrated, industrial companies' and 'Continue unchanged'), then to the strategy of the innovators, and last to the conservative strategy.

This is not surprising, because this is what the political system has recommended, but nevertheless, it is not an effective and targeted strategy, since the evidence - that any of the sub-strategies of the traditionalists have had any significant effect on productivity etc., measured on the period until now - is missing. - See chapter 10.

Therefore, the result can be interpreted in several ways: Either the majority of the panel just follow the convention and do as 'the government recommends'. Or, if you have been trained in, took a long education and finally became familiar with the old building process and its business model, it is hard to imagine something new and different - and it is probably even harder to find the motivation to do it.

Against this background, it is nevertheless surprising that the integrated model ranks so high, indicating that the 'innovator' is not the only one thinking along those lines.

The fifth question *(Why hasn't the building industry progressed like other industries?)*
This question is special, because it has never been established authoritatively, why the building industry has not developed like other industries; and with the options given, it is not possible to give a 'wrong' answer. All answers are likely

to explain at least some of the problem and furthermore unconsciously tell just as much about the panellist's way of thinking.

As expected, there is no agreement on the cause of the lack of development, but when ordered according to the highest score (replies including the 6th panellist are shown in brackets), the priority of the panel is:

1. (1) - 5.3 The basic problem complex has not been recognized – therefore the problem cannot be handled and solved.

Score = 17 (21), Median = 3 (4).

This is the open answer, stating that the problem has yet to be analysed, understood, and described. Fits well with the attitude of the 'traditionalists' – otherwise they would not be able to suggest a strategy that with almost certainty will have no effect…

If one does not understand the problem, one is not able to see the barriers for transformation.

2. (3) - 5.5 Fundamental transformation requires large investments in fixed capital and education.

Score = 16 (16), Median = 4 (4).

Even though the building industry is highly subsidized, direct investments in the industry are very rare. Public investments are typically indirect and go to the taxpayers, or the financial sector in the form of interest deductions, tenant subsidy, 'support' packages for energy reduction and repair, etc. and not directly to the business enterprises in the building industry in order to help them to industrialize or increase productivity. The subsidies in reality maintain the building industry at the current development stage and do not promote industrialisation. The construction industry is not a stable investment environment without a long term government strategy. The panellist from the contractor's organization has given the mark of 5 on this option. The constructing architect and the panellist from the building industry did not find this important.

3. (2) - 5.1 The building industry is 'locked' in a situation with no incentive to change and that prevents 'learning'.

Score = 14 (17), Median = 3 (3).

The old building process, the fragmented building industry, and the public subsidy structure are locking the building industry… The constructing architect has placed a mark of 5.

4. (5) - 5.4 Some stakeholders do not benefit from and therefore do not want change.

Score = 12 (13), Median = 2 (2).

It is true that some stakeholders will not benefit from industrialisation, e.g. architects and craftsmen, who will risk getting redundant if, integrated, industrialised companies with integrated production, design, and marketing, were to emerge and grow. The panellist from the contractor's organization has place a high mark on this option.

5. (4) - 5.2 The building industry is marked by an old, conservative building culture, which the industry cannot get out of by itself.

Score = 10 (15), Median = 3 (3).

The willingness to seriously experiment with new processes etc. is seldom and the industry is marked by romanticized notions about the old craft era. The panellist from the building materials industry probably has experienced this and has given the mark of 5.

6. (6) - 5.6 The market mechanism does not work in the building industry.

Score = 6 (8), Median = 3 (2).

This is both true and false. The market mechanism does work, even to an extend that the operators do not make a decent profit, but on the other hand the mechanism does not separate the bad operators from the good, and certainly the market mechanism does not work like in industrialised industries. A high mark by "D" indicates that the panellist would like a stronger capitalistic or contemporary market mechanism to promote industrialisation.

These replies almost require that the panel is asked: What constitutes the problem complex that forms a barrier to the industry's development?

13.2.2 Second round:

Before answering the open questions the discussion theme was delimited to the construction of **new buildings** within the category of construction activities, in accordance to DB07 (Danmarks Statistik, 2007). The production of Building

materials etc., consultancy services, and renovation and maintenance work were excluded.

So, it is primarily the construction of the 90-95% new homes, offices, institutions, etc., and the work, which predominantly takes place at the construction site, using the old building process and the associated business culture that is the starting point for the discussion of the future development of the building industry.

Only 2 panellists answered within the deadline "B" and "D" – "E" replied some weeks later, when the consultation had stopped and therefore his replies were not distributed to the first two.

The first discussion theme:

The Panel has suggested that the reason for the building industry not to go through the same development as other industries is: "The fundamental problem complex is not recognized - therefore it is not handled and resolved." It might be natural to discuss:

- What is the fundamental problem complex? ... or what barriers prevent the construction industry to develop as other industries?

  (The missing investments in fixed capital and training, we shall not discuss here, but maybe they are connected with the modest appetite to invest in an industry that has refused to define its own problems ...).

The essence of the replies was:

"B": … The basic problem complex is not that complex, if we only look at the contractors. It's about poor management and communication, which often leads to late delivery, and buildings that do not meet the expected quality (defects). Meanwhile, contractors are pressed on their earnings, because of the narrow focus on price, giving them no possibility to rise up from the mud.

"B" ... Another barrier is the loose coupling between companies of different nature, finding themselves at different places in the value chain, which again bring along new cooperation partners from project to project, thus making things harder than they needed to be.

"D" ... The major problem of the building industry is that you are working in projects, the way you do ... here the problem is that the entire design and

building process is fragmented ... The holistic understanding of the building project disappears ...

"D": ... Or, expressed in another way: The building industry's problem lies in the entire societal set-up, which starts with the market for buildings, backed by public regulation, developed by the actors and which maintains itself.

"E": Focuses on that "development - and especially jumps in evolution - occurs through an interaction between market and supply…" and believes that a prerequisite (for development) is a constructive and long-term interaction between client and the industry.

Analysis of the answers to the subsequent, open questions.
Sub conclusion

Unconsciously, "B" gets to accuse the project production mode itself ('loose coupling between companies ...') and the craft production mode ('…it's about poor management and communication, which often…'), which has not attached a management toolbox to ensure quality, deadlines or earnings that are high enough to accommodate the opportunity for development. So it is unconsciously a critique of the Buyer Controlled Procurement Model and the lack of industrialisation.

Also "D" finds that the project mode is a problem and furthermore that 'the entire design and building process is fragmented… and concludes that the entire societal set-up is a problem: The market, the public regulation etc., which maintain the industry at this stage - without development.

This is the closest we get to an indication of a systemic barrier.

"E" finds that part of that 'remedy' is a long term interaction between client and industry, which in a Danish context only can take place, if the government is involved to implement a development strategy.

There is a clear understanding that 'construction' or the building process is fragmented. On that background it is surprising that the panel did not designate a possibility that solves the current system's shortcomings, e.g. a company with *integrated design* (to reduce fragmentation), *manufacture* (to transform projects to routine industrial production, which reduces the problem

with shifting subcontractors and bad cooperation) *and marketing* (customers instead of a client).

Everybody knows this transformation process is not an easy one, but to start the process, it is absolutely helpful to know 'where you stand' and you can only know that, if you dare to compare the building industry with the Seller Driven Marketing Model of the more advanced industries.

But there is surprisingly little understanding of the rather big differences between the industrialised industries and the building industry, and it appears to be very difficult to drop the concepts of the old building process and its associated business model, and instead start to think in new, innovative tracks.

On the one hand, there was a single indication of a systemic barrier, but on the other hand the replies did not bring about a clarification of the question asked. The answers largely repeated the already known explanations.

My conclusion is that the building industry is only partly able to explain and understand its own problems. This constitutes a barrier for transformation, at least based on the 'old players'.

The second discussion theme:
The relatively high concurrence on the possibility of changes of the current professional boundaries and mergers of companies across disciplines, suggests a progression in the direction of "industrialisation". The panel gave priority to the following development options:

- "Increased use of IT", "Increased use of prefabricated building objects", "Enhancing cooperation in fixed constellations" and "Value Optimization and Lean Construction." Should these options be seen as different paths towards industrialisation, albeit at their own pace?

- The establishment of "new *integrated, industrial construction companies* with integrated design, production and marketing that are able to harvest the rationalization gains, and are able to produce for *unknown customers*, like other contemporary companies." Is this possibility a future object for the above development options?

- Is there an alternative development option - can the industry take a shortcut to a modern, rational version of the building industry?

The essence of the replies was:
"D": I would not say different "paths to industrialisation." It is rather different aspects of industrialisation. Implemented separately - and that's what happens - they will not have a significant impact on development.

"B": 'Digital construction' is outdated as a concept. Now it's all about BIM... BIM in a traditional design structure without rethinking the mode of collaboration and production methods will only allow an inappropriate process, and will not provide the full potential of the opportunities.

"B": ... We saw this with partnering: It has not really gained ground, which I think is because the actors had not prepared the theoretical foundation, and did not understand the processes involved. The major contractors, NCC, Hoffmann, etc. who previously discussed partnering, are now talking about lean construction, and actually profit from it!

"B": ... the integrated, industrial company, which I definitely think is an option and an evolution from a lot of independent development directions, will not necessarily be a construction company. But this should not prevent anyone from implementing the idea, if it makes sense. It is not a future goal in itself; better, cheaper housing is the object.

"D": ... I do not believe that the market is prepared for big, "integrated construction companies." There is a problem with the volume of different types of buildings such as swimming halls or schools.
(This is partly a misunderstanding since the discussion was limited to the 90-95% of the new buildings, most suitable for industrialisation. However schools might be perfect for industrial production techniques – my comment).

"D": ... If there is an alternative option or shortcut, then it is strange that it has not emerged. ... Perhaps there may be a more diversified solution where it is not "the building industry" that is acting.

Detached houses and cottages could probably be built in a different way…

"B": ... There are certainly alternative development opportunities. But whether the industry can take a shortcut, I doubt it.

"D": ... Construction problems have been discussed ad infinitum.

"E": "The answer is in my view re-industrialisation. Industrialisation, inevitably leads to tighter cooperation, integrated production and increased use of IT. Value optimization is also on the cards and Lean is precisely an industrial concept". … "The thoughts are there, so in my view the challenge is to create the market". … "E" suggests cooperation between the industry and the public authorities about breaking the barriers. … "Alone, the industry can only move slowly, using lean construction and the like".

Sub conclusion

"E" is right, "re-industrialisation" is the correct term in the light of the 'first wave' of industrialisation in the 60's, and the challenge is to create the market. But apparently it is difficult to comprehend that in order to do that, the old craft based building industry model must be transformed. This is the hard part both to understand and to implement.

According to "E", "Lean is precisely an industrial concept". Lean is borrowed from the Japanese car industry (Toyota), which has the most sophisticated mass production; but implemented in the context of the craft based building industry, there is simply no evidence that Lean Construction has transformational potential, which "E" admits indirectly by advertising for cooperation between the authorities and the industry, because "Alone, the industry can only move slowly, using lean construction and the like".

However, it is encouraging that the panellists do not succumb to escapism by pointing to an unknown alternative way (a shortcut) to industrialisation and that the panellists realize that the traditionalists' sub-strategies are leading to slow industrialisation, clearly stated by "D": "Implemented separately - and that's what happens - they will not have a significant impact on the development."

This is a de facto indication of interdependence between some of the elements in question.

"E" is in line with this.

But on the one hand the panellists see the limitations of the traditional sub-strategies, while on the other hand, they speak with 'wool in the mouth' when trying to clarify, what they see as the future goal.

"B" finds that the 'integrated industrial company' definitely is an option, but is not ready to recognise this, as the most 'qualified guess' for the future industrial development of the building industry.

"B" has a tendency to jump from one fad (digital construction) to another (BIM), from 'partnering' to 'lean construction', etc. When one thing proves to be useless, one can always jump to the next fad.

This is an obvious indication of the insufficient understanding of the fundamental problem.

13.2.3 Third round:

To connect the survey to my thesis, I made some *introductory comments and* added one additional *question to the panel*:

> "The problems of the building industry have been discussed endlessly in the 40 years, I have followed the building industry and in the last many years without changing opinions significantly.
>
> Perhaps, it is part of the problem that the discussion has been too oriented towards the product and production. Maybe the deadlock factor and therefore the underlying problem complex are to be found in **the business model,** which the old building process is associated with. The way business transactions between buyer and seller are organized, is certainly not irrelevant to the development of an industry.
>
> The uniqueness of the building process is that it traditionally always has been and still is organized around the client, who 'employ' consultants and contractors, often after one or more buyer-driven tenders (in the form of a competition, tender etc.), where the client specifies the work and determine the conditions of competition. Legally and formally the client is part of the

process, because he heads the building process, assuming responsibility for security on site, compliance with the Building Act, etc”.

This leads to the question:

Do the panel believe in the emergence of modern, integrated business enterprises in the building industry, within a time span of about 10 years, which have left the old building process, including the buyer-driven business model (meaning without the disadvantages stated by the panel) for the private assignments, where there are no legal barriers to using a development-oriented and modern, seller-driven business model?

The replies were:

"D": “It is however easy to answer: No.
The old building process has demonstrated that it is very tenacious. It has been highly criticized, and there have been many political initiatives to change it, but nothing has happened. Therefore, I do not think that a new business model *will come by itself*

But it's a really good question, why we have not already seen a new business model? Or what changes it would take to promote a new business model?” (my italics).

"B": “The answer is no!
We are likely to see different business models, pointing in that direction, but currently the building industry is economically pressed and it's the buyer's market. And the buyers / customers want customized solutions.

I have doubts whether "the seller-driven model" has given buyers more choice. Is it not rather the customer-controlled? As a previous seller in a manufacturing company, I have no doubt that the seller will go far to give the buyer options, but "whole truckloads" are always cheapest. I might not be sure that a seller driven model will always listen to all customer wishes. Or more precisely - to society. If we are thinking about the process - and we constructing architects do - it is true that a more professional business model, which I would prefer to call integrated, can be more effective. And of course, the customers must have

a more central role. It is their expectations, which determine whether we succeed or fail.

But the integrated firm will not solve all problems. Many problems origin from the lack of cooperation and lack of information transfer between the actors. And there will be many - even in the integrated enterprise. We will still see cooperation problems between people with different educational backgrounds and cultures. Corporate cultural differences might disappear, but alone the mental and cultural differences between, for example architects and constructing architects (product versus process), or between sellers and contractors (whether they are on a factory floor or construction site) will still challenge cooperation. Whatever it's all done industrially or not, we still need different competences for different tasks. And there will always be things to be delivered by other actors, which in turn must be incorporated in a cooperation process..."

"E": "My short answer is No; I do not believe that a new type of business will occur in the current market. Perhaps in the market for catalogue houses, but hardly in regard to multi-family housing.

We tried in the PPB program[18] to identify such a business enterprise in 1:1 - cf. the Habitat Handbook. We found that it probably would be feasible, but also that it would hardly be possible to find the necessary willingness for risk-taking. Today, I would further argue that an investment in a bigger market - such as northern Europe – would be necessary, which would make it even more difficult. NCC tried some years ago and it did not work".

Conclusion after the third round

There is no agreement on the future development in the building industry apart from a vague idea about the future involving some form of industrialisation. It is apparently difficult for the panel, at an operational level, to understand the differences between the old Buyer Controlled Procurement Model and the Seller Driven Marketing Model, which represents the norm in the rest of society.

[18] Product-Process-Build. One of the former government's programs from around 2000.

In the point of view of "D", a new business model will not come by itself, which corresponds to the opinion that a government programme is necessary to initiate a transformational process.

"B" finds it difficult to abstract from the current recession, where it is 'the buyer's market, and demonstrates that here and now, without a long explanation, it is difficult to understand that the Seller Driven Marketing Model provides advantages for the customer (lower prices, more product development, fewer defects etc.) compared to the old Buyer Controlled Procurement Model, which is known to provide a knowledgeable and experienced client with maximum influence, but a less experienced client and ordinary 'users' almost none.

It is however vital to understand that the Seller Driven Marketing Model implies that the company recognizes the necessity to learn the marketing skills that belong to that model, for instance that no company can satisfy all customers' needs and wants, but that every company has to segment customers and specialize in satisfying the needs and preferences of the chosen target group.

"B" finds that a more professional business model can be more effective and asks for a more central role for the customer. Again "B" does not recognize that the building industry has no customers – only clients!
Of course the integrated company will not solve all problems. It will take time to make it work, and to reduce cooperation problems.

However, it is most likely that 'new players' must start the process. The old enterprises and trade groups must undergo a thorough de-learning process before being able to comprehend a new model.

"E" finds that it probably would be feasible, but also that it would be difficult to find the necessary willingness for risk taking. Today it would require a larger home market such as Northern Europe. To succeed in such a market would require that the integrated company would be able to demonstrate the ability to reduce prices considerably, which has been a problem in previous attempts.

My conclusion is that there is some kind of consensus concerning that *a new model will not emerge by itself*. Nothing will happen without the government taking the lead. The mutually beneficial collaboration between the public and private sector is the very core of the Scandinavian model.

13.3 Evaluation of the **suitability of the** Delphi method

With a limited number of panellists the 'statistic feedback' has little value and the total lack of discussion among the panellists makes it doubtful to fulfil the preconditions of the classical Delphi method. Therefore the uncertainty in this survey, of the results of the Delphi method in regard to its forecasting qualities, is considerable.

So far the outcome of the Delphi panel consultation has not helped to get to the core of the problems, we do not find new ideas as to the future development of the building industry, and most importantly it has not helped to test the research hypothesis (the interdependence between the variables).

The Delphi Consultation shows that the participants have difficulty to:

- Secede from the old building model's way of explaining things,
- Explain why the construction industry is 'special'; instead it tends to be accepted as a precondition,
- Believe that change is possible, especially in the direction of the prevailing industrial, seller driven model.

But in return it leaves me with an explanation problem. Why are these experts not able to comprehend the 'problem complex' and subsequently predict the direction of the probable future?

- Is this survey aiming in an irrelevant direction? It is of course possible but unlikely, because an industry model, which is similar to the prevailing model in nearly all other industries, is hardly irrelevant. – The answer is linked to the test of the research hypothesis.
- Have the 'wrong' experts been chosen? Again this is possible but unlikely, since some of the most progressive and well oriented 'experts' have been chosen, who know the pertinent literature, but do not know the conceptual formations of the Buyer Controlled and Seller Driven models, because this way of seeing things is new.
- Are the panellists trapped in their own mindset and unable to secede from the old paradigm? This has to do with the fact that the experts are trained exclusively in the old Buyer Controlled Procurement Model and are considering the industry and its future from the viewpoint of that model. It

takes time to realize that the ‘client’, who formally has all the influence one could aspire, could beneficially be replaced by 'customers', whom you do not know, and who have only indirect influence. It is, likewise, time consuming to realize the benefits of the seller driven marketing model, when you are not familiar with and trained in that approach. This is an important reservation in regard to the analysis of the survey.

13.3.1 A dimension is missing in the analysis

Therefore a more suitable method to *analyze* the outcome of the Delphi survey is needed. Had one asked typographers 30-40 years ago about the future of the graphic industry, it is not likely that they would have foreseen the rapid development, which made their profession redundant in a matter of years. And on the other hand, a person from outside the industry is not aware of the problems in the industry and therefore does not qualify to be a specialist, panel member.

This is a decisive weakness, because it is a question whether the panel, regardless of its composition, is able to see through the complex problems, when a very old system has outlived itself and faces the need to eliminate itself.

However, this weakness would also apply for a questionnaire survey, an interview, focus group or similar methods. The result would be the same: An important dimension is missing in the analysis of the study, making it difficult to analyze the responses in a meaningful way and to explain ‘the unexplainable contexts' and the fundamental problem complex.

- But how can it be explained that ‘experts’ are not better at forecasting the future and how can this be an indication of the hypothesis being true?

The problem might be illustrated by an analogy from the former East Europe: If a group of former East German managers had been asked to suggest ways of transforming their system to the western business system - something they had no experience in, but saw as desirable, it is most likely that they would have groped in the dark. It proved to be a difficult process for the East German companies and employees. The most successful transformations involved new

companies from outside the former East German economic system, companies who had no ties to the former production and its business culture.

The **missing dimension** of the analysis has to do with recognising that different systems and periods in history are marked by their own mindset. What is identified in its time as fact (what can be proven to be true rather than believed to be true) is usually characterized as 'scientia' = knowledge. But when dealing with transformational processes even scientia is only valid within its own historical paradigm and therefore is not a constant phenomenon.

In the same way as Niels Bohr (1885-1962) emphasized in regard to recognising his periodic system, the quantum theory and quantum mechanics, it could only be developed, if one learned to "give up habitual conceptions" (Favrholdt 2009) because Bohr's atomic theory breaks with some of the principles of the classical physics; in particular the principles of causation, determinism and continuity (Favrholdt 2009 p. 91) - the problems of the building industry (without comparison otherwise) can only be understood and developed, if the industry learns to break with the pre-industrial thinking that maintains the old building process and its buyer controlled business model.

14. From an old to a new mindset

Can one think the unthinkable (Møllehave 1985) [19], as Hans Christian Andersen (1805-70) asked? On the one hand the question is a contradiction in terms, but on the other hand, if one includes the concept of a paradigm / episteme, the answer to this logical problem is simple: What appears unthinkable in one episteme might seem natural in another!

14.1 From the 'craft' episteme to the 'industrial'

The French philosopher Michel Foucault (1926-1984) developed the toolbox to analyse transformational processes in society and various professions etc. across historical periods.

In (Foucault 1970), he introduced 'Episteme'[20], as a key concept to elucidate his historical analysis. Foucault uses 'episteme' much like 'paradigm', meaning the predominant knowledge in a given historical period, and he uses the two terms 'episteme' and 'science' to describe two different things. What is regarded as science varies from episteme to episteme – Foucault uses 'episteme' to disclose exactly that; and furthermore, he insists that an episteme is not only 'science', but is constituted by the dominant discourse in that era, profession or science for that matter.

An episteme is a product of the conceptual formations, see appendix D that orders our thinking and decides how we think, and of what.

A particular episteme allows certain things to be thought and said and hence also explains why other forms of knowledge at another time were not

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[19] "F.eks. vil tanken tænke det utænkelige. Men det utænkelige er jo uden for tankens rækkevidde".

[20] **Epistémé** (greek: ἐπιστήμη) means, in Platonic terminology, knowledge, relating to active perception and cognition, opposite 'doxa', which in this context is identifying beliefs / opinions / attitudes (which might purport to be knowledge). Doxa is the beliefs / opinions / attitudes that are not based on knowledge. From Episteme derived the name of the philosophical discipline epistemology. The word doxa, yet with a slightly different meaning, we recognize in words like 'orthodoxy'.
From the Middle-Ages to the Great Enlightenment, 'science' had more-or-less the same broad meaning as "philosophy". Later "natural science" began to separate from 'philosophy' and later again the social and human sciences.

possible, since some contexts and necessities were hard to grasp for the field of knowledge of the period and therefore non-existent in mans consciousness.

Also an episteme is not self-reflexive, cannot think about itself and therefore can only be analyzed retrospectively, that is through an 'archaeological' survey.

This might help explain why the building industry is so 'special', why 'learning' is not working, and also helps to understand the confined interaction with other industries and with science.

In part II the use and attached practice of key variables (the conceptual formations) were described and compared across two time spans:

The pre industrial episteme: Production, leadership and business reminiscences from the pre-industrial, craft based historical periods.

The industrial episteme: Production, leadership and business conceptions from our contemporary industrialised and post-industrial periods.

The selected variables in this thesis are not random, but basic, conceptual, systemic formations, which the building industry must relate to, in order to cope with both the business and profession.

In (Foucault, 2005 (1969)) he claims that the formal knowledge fields such as the **sciences** (medicine, economics, etc.) also **include the practices that surround them** and that there can be no knowledge without a particular discursive practice. (Foucault 2005 p. 251)

(In relation to the different episteme, the sciences also cover different contents – thus the sciences do not cover a constant, fixed subset of reality).

From this follows that any discourse is part of and surrounded by a social practice. The two are interrelated: **If the discourse is pre-industrial, so is the social practice – and vice versa!**

Therefore persons who belong to different traditions that again represent different episteme might have problems understanding each other.

In part II, it was also shown that *both the practice and the discursive, conceptual formations used in the present building industry origin from the pre-industrial era.*

A new episteme and empiricism

In the context of new thinking, innovation and creative processes, it appears that 'empiricism' works best within a given episteme, and perhaps not at all between two episteme, because the **interpretation** of the empirical data must take place using the mindset of the old episteme. In this way, empirical data are less suitable to establish a new episteme. New thinking and new epistemology are based on ideas and theories, before they later can be established as real knowledge = scientia.

In the same way, it seems a specific version of 'wisdom' only exists within a particular episteme and consequently the concept of wisdom is not a constant feature, but relates to the episteme, which created that version of wisdom. A new episteme will have to fight the old wisdom to prevail, which by nature is a barrier for any paradigm shift. Wisdom tends to represent the static condition and is trying to conserve the existing order of society by protecting the established values and norms within a given episteme. The apprentice system for instance represents in its most effective adaptation the incarnation of the wisdom of the pre-industrial episteme.

But which wisdom should be used between episteme, when the old version is dying, and a new one is emerging and you are uncertain about, what the new adaptation is all about…?

An illustrative parallel to this is the 'fate' of the medieval world's 'Seven Mortal Sins' – which all are transformed into virtues in today's profit, and individualistic oriented capitalistic society (Lindhardt 2009).

Traditional, qualitative research methods and the analysis of transformational processes 'across-episteme'

The qualitative field research methods (interviews, questionnaire, and focus groups) are suitable within an already established episteme, but perhaps *less useful to investigate relationships 'across-episteme'*, because what is regarded as certain knowledge, science, and wisdom is not unchangeable entities, but vary from episteme to episteme.

Answering questions as well as the analysis and interpretation of empirical data logically will take place using the mindset of either the old or new episteme, depending on which episteme, the respondent and analyst professes.

In the case of the building industry, this depends on whether the respondent and analyst are aware of the difference between the two episteme in regard to the industry's problems and recognize the consequences.

In the typical transformation situation the mindset of the old episteme will dominate as long as that episteme is not challenged and represents the dominating knowledge (in the profession etc.), because 'an episteme is not self-reflexive'.

It appears that this is what is seen in the Delphi panel consultation.

The problem is illustrated by how 'competition in the building industry ' is regarded in the Delphi Panel Consultation: One panellist ("B") believes that competition is too hard, another that competition simply is not working ("D"). In a traditional analysis, both opinions cannot be right. But when using the episteme concept, this contradiction can easily be explained. Competition is tough seen from the point of view of the pre-industrial episteme, while it is 'not working' from the viewpoint of the industrial episteme.

Given this, it would be the expectation that the Delphi panel predominantly would maintain the viewpoints of the Buyer Controlled Procurement Model and find it difficult to abandon the old episteme.

From the Delphi consultation, it is seen that the panellists hold on to the old concepts and old practices, whether they are aware of the relationship or not. The panellists agree that the old building culture is tenacious and that the building industry is unable to complete a transformation to the industrial episteme by itself.

For the learned professional the hard thing is to realize that the building industry in its core is pre-industrial, craft based, out of harmony with society, and therefore obsolete.

It is a question, if the panel members truly are aware that the building industry does not have 'customers', but clients, that the industry uses a Buyer-Controlled model instead of a Seller Driven model etc. And it is a question, whether they are aware of the important implications of this?

It seems that the panel uses the concepts *indiscriminately*. Only with regard to production, there is some awareness that the industry distinguishes itself by being organized in projects rather than as routine production.

The situation will probably not change until a crucial new recognition, probably as a result of an imperative external influence, will compel the necessity of a transformational process towards a new episteme.

14.2 Sub-conclusion

Analyzed and understood using Foucault's episteme concept in the light of a historical analysis, the outcome of the Delphi panel comes as no surprise. When seen as a transformational process across the old pre-industrial and the industrial episteme, 'the unexplainable contexts' and the 'fundamental problem complex' become much easier to understand, like it becomes more obvious to accept the hypothesis of inter-dependence between the variables. The transformation required is a systemic change.

In addition, the episteme concept offers an approach to both the de-learning of the old building process and the learning of the new building industry model.

The Foucault inspired analysis offers a plausible explanation of why the building industry is so special, why it could not change by itself, like other industries and why productivity and product development could not keep up with the seller-driven industries – and why the panel could or would not see 'the future'.

Instead of contributing to the discussion of the building industry's future, the Delphi consultation resulted in confirming the tenacity of the pre-industrial episteme.

Part V. RESULT

15. Conclusion

In the literature and debate of the last many years, there are a lot of 'explanations' for the bad performance in the building industry and most are to some extent or partly right. But none of the explanations, I have come across, embrace the whole complex of problems and provide the kind of understanding and overview that presupposes the understanding of a transformational shift away from an obsolete industry model and prepares for the future change to a seller driven building industry.

What we still see, is a Danish building industry that is trapped in the old pre-industrial building industry model with its characteristic set of variables that is different from the set of variables used in the industrialised industries.

Each variable is specific to either the old or new building industry model. The variables are not interchangeable between the craft and industrialised production modes, because of their different and conflicting focus on 'skills' and 'productivity'.

Or put in another way: An old, inefficient mode of production cannot be made effective alone by adopting e.g. the leadership and management practice of other more developed production modes. The attempts by industrial production and management - to get rid of the obvious weaknesses of the client's project production - has not led to vital development of the building industry and an increase in productivity, because the industry has yet to recognize that it is the perception and role of the buyer and the buyer-controlled procurement model that maintains the industry in the craft era.

It appears that none of the 'borrowed' strategies from the other industries have been able to work in the building industry, because the old building industry model is not compatible with those tools and not capable of working with strategies that are made for industries that are already industrialised.

Instead, all efforts should be focused on the transformational process to a seller driven industry

Looking at the technological aspects, there are no *barriers* for transformation, but there is a *systemic barrier*, because the entire pre-industrial system has to be transformed to the industrial system at the same time, to lead to major productivity increases and product development with price reductions instead of increasing prices.

This constitutes the major barrier for a transformation of the building industry: All four variables must be changed simultaneously, if the required increase in productivity is to take place, enabling the desired reduction in prices - to the benefit of the customers. The fact that the barrier is systemic is an indication of 'interdependence'.

The transformation required, is a systemic change, implying that the hypothesis of this thesis can be accepted.

Also the *statistical* analysis, the surveys and data (see chapter 10) *indicate* that the Buyer Controlled building industry is performing worse that the Seller Driven industries and that it is worthwhile to aim at transforming the building industry and that *the hypothesis of this thesis can be accepted.*

The stagnating productivity in the building industry is known *internationally*, see section 10.7 and according to Picard (2004) the American labour requirements in construction could have been reduced by 50%, had the productivity in construction achieved the productivity growth of the overall U.S. economy during the last approximately 40 years. This illustrates the importance to society of the future transformation of the building industry.

15.1 The contribution to knowledge of this thesis

This thesis has demonstrated that:

- There is *interdependence* between the variables: Procurement Model, Buyer Perception, Mode of Production, and Leadership and management in a certain industry.

- In the context of the building industry the variables of the two business models that characterize respectively the craft era (the Buyer Controlled Procurement Model) and the industrial era (the Seller Driven Marketing Model) are *not interchangeable*, implying that *systemic barriers do exist*.

- A transformational process to the Seller Driven Marketing Model is required, if productivity is to increase, and result in price reductions for the customers.

Furthermore this thesis has:

Analysed the *differences* between the building industry and the industrialised industries in order to clarify the nature of the basic problems - instead of describing the symptoms that these problems are causing in the building industry.

Described and analysed the *barriers* for the transformational process from the Buyer Controlled Procurement Model to the Seller Driven Marketing Model - demonstrating that *it is predominantly each variable's relation to the building process and its associated business model* that determines the affiliation to respectively the old craft era or new industrial building industry model. The systemic barriers likewise illuminates the causes of the widespread neglect of the need for industrialisation in the building industry.

Analysed and indicated *the transformational route* to the industrial Seller Driven Marketing Model that includes the possibility to increase productivity, lower construction costs and customer prices.

Shown that the transformation of the building industry *requires a systemic change* of the investigated four variables *simultaneously* and demonstrated that

it is *not realistic to expect elements from 'the industrial episteme' to increase productivity* in the pre-industrial building industry.

For the *architect's firm* the future challenge is to participate in a double transformational process: *Both* to make the knowledge workers productive at the architect's office through creative learning and the use of 'science' (instead of the 'divine' inspiration of the artist), which in many ways involves a shift in thinking and certainly in market approach, *and* in composing building designs that possess a workable interface to *industrial* production. An interface, which reduces the amount of work to be performed at the building site, and increases prefabrication, plus not the least, enables manual factory workers in the production in the building industry to get rid of the dependence of tradition and its unproductive skills. All without losing creative opportunities in regard to the buildings *artistic idea, function and form*, but with the purpose to enhance the *buildability* of what should be seen as the 'product'.

15.2 Further research

The Delphi Panel Consultation showed that there is no agreement on either what the problem in the Building industry is or what transformation strategy should be followed in order to industrialize the building industry.

This study has provided more clarity on the nature of the problems connected with the building industry, which moves the research focus to the next set of problems:

- The implementation strategy for the transformation of the building industry from a Buyer Controlled to a Seller Driven industry.
- The formation of genuine seller driven business enterprises in the building industry to build up a well functioning market for new buildings.
- The coupling of learning, knowledge and leadership to develop the kind of 'Creative Leadership' which initiates change processes in the building industry.

Part VI. ANNEXES TO THE THESIS

Appendix A. Chronologic overview using the 4 parameters

Schematic, chronologic overview

Development stage of **S**ociety (Political, economical, cultural and technical development setting the standard in general in society)	**P**roduction mode	**Leadership and management**	**C**ustomer relations and procurement
1. Feudal society (1500- 1850)	**Manual work** + craftsmanship		
Nobility and dependant peasants. The main production is connected to agriculture and the secondary to craftsmanship. Education for nobility and upper class CULTURE: COLLECTIVISM controlled by the church.	A production type characterized by low volume, high-variety and high quality. European originated. Home market orientation. Low import-export ratio.	Leadership: Power based. Organization: Family like. Strong leadership in craft production through the way skills were developed: Master > journey-man > apprentice. Each trade created a guild of skilled people with the purpose to control the supply of their speciality. A **balanced** system where the leadership is in conformity with the culture in society and the production type.	A commissioning **client,** who controls procurement, product design, product development etc. Suppliers had to focus on compliance and pleasing the client.
THE BUILDING INDUSTRY:	The building trade is like other trades.		In the building industry the client also had leadership responsibilities. The client hired skilled workers and specialists like the master builder, architect etc. The old 'Patron - Client relationship'.
2 A. Liberal capitalism (1850 – 1912) Capitalists and workers. People move from rural areas to become workers in the new industries, which again shape the new metro pole cities.	**Industry**, steam machines using **mechanical** automation but still **craft based**.	Leadership: Organization: Family like. Same principles as used in "The Roman Family".	A mix of the commissioning client and **customers** buying manufactured products which have been produced for stock and are sold in retail shops.

Money is invested in fixed assets such as machines and buildings Imperialism & colonies: Strong work division – raw materials from the colonies are manufactured in Europe. Introduction of education on a low level for ordinary people. Children learn to love God, their nation and strong discipline at the assembly line. CULTURE: Class consciousness			
THE BUILDING INDUSTRY:	The building industry is unchanged – still manual work: low or no use of new technology.	The building industry is unaffected: Leadership culture is implemented through the guilds and Master>journeyman> apprentice training system and thus preventing change. Architects manage the erection of the building and controls the trade contractors	Exclusively the commissioning client. Procurement using the tender system.
2 B. Liberal capitalism (1913 – 1945) The second stage where labour unions gain strengths.	**Industry**, steam machines using **mechanical** automation. The assembly line was introduced in USA at Ford in1913, creating **mass production**. USA with mainly unskilled workforce could not compete with Europe and therefore destroyed the competitive position of craft production (Brown et Al 2005). Standard products with low price. High volumes with little variety.	Leadership: Introduction of Manage-ment, Work division, Specialisation etc. to control automated production with unskilled work force. Scientific management (Taylor) to control the assembly line. Organization: Still family like at Ford. (Drucker 1999). Management has a limited effect because it is not properly linked to the organization. Industry production replaces a lot of skilled workers. Unskilled workers are seen as an 'attachment' to the machines.	A mix of commissioning clients and **still more and more customers** buying manufactured products which have been produced for stock and are sold in retail shops.

THE BUILDING INDUSTRY:		The building industry is unaffected: Leadership culture is implemented through the guilds and Master>journeyman> apprentice training system and thus preventing change. However in the most industrialised countries skilled building workers are replaced by unskilled, resulting in a decline in quality.	Exclusively the commissioning client. Procurement using the tender system. .
3. Interventionist social capitalism. (1946 – 1981) Welfare state in developed regions and decline in GDP in liberated but undeveloped countries. Introduction of higher education for ordinary people. CULTURE: INDIVIDUALISM gets stronger as class consciousness declines.	Industry, **mass production** using **electrical** automation. More variety. Production gradually coupled to marketing. (Is only applicable in developed regions). (First PC)	Leadership: Management is further developed with payment by the piece and bonus systems. HR takes the psychological needs of workers into consideration. Management theory is seen in relation to organizational theory. Organization: Hierarchical, bureaucratic organization.	A buying **customer**. Product development initiated by the seller, who uses the marketing concept to analyse and satisfy the needs of selected target customer groups.
THE BUILDING INDUSTRY:	Only small changes in the building industry: New materials and processes emerge, but still most of the work is performed on site. First examples of industrialised production of single building elements.	(In the building industry some small elements of management emerge, but mostly in the administration). The special Stage or Phase 'Project Management' Model is used in the building industry.	Predominantly the commissioning client. Developers and D-B contractors begin to emerge. . Procurement using the tender system, but there is a development in the contract types: D-B and general contractors, who take over the architect's management role. Engineering firms grow faster than architects.

4. The present Hyper complex society. (1982 –) Global capitalism Strong competition between the Knowledge and Research centres in the developed regions: EU – US – Japan + East Asia. Manual work moves to the undeveloped countries in the periphery. The education system in the building industry still has to be different, due to the old production type. THE CULTURE IS SUBDIVIDED: CONSUMERS: INDIVIDUALISM and subcultures. BUSINESS: COLLECTIVISM (the loyalty of employees shift from the Union to the corporation).	Post industrial, **knowledge** based, robotized production CAD/CAM Computers, Internet, Mobile phones. New technologies emerge still more frequently.	Leadership: Customer and **market orientation**, 'industry' project management. Organization: Flat organization, Team work. Rapid changes that follow market and customer preferences.	Customer integration (focus on collaboration with customers and their stakeholders on the satisfaction of needs and wants)
THE BUILDING INDUSTRY:	More and more building components (wall elements, windows & doors etc.) are produced in an industrialised way and transported to the building site. The drawing offices are using IT for administrative purposes and CAD for drawings - creating a gap to the production on site.	In the building industry it proves still more difficult to catch up and follow other industries – even though many attempts are made to introduce modern leadership and management. But the result is a **fragmented** and ineffective use of leadership and management due to the reminiscence of pre-industrial workman- and craftsmanship, procurement route and buyer perception.	

Appendix B. Annexes to the Delphi Consultation

B-1. Introduction letter to invited panel participants
(English translation after Danish text)

26.05.2011/ekk

Delphi panel konsultation: Byggebranchens udvikling

Som et sidste led i min PhD afhandling, der omhandler den **danske byggebranches fremtidige udviklingsmuligheder**, planlægger jeg en Delphi panel konsultation, hvis formål er at rådføre et lille ekspertpanel om branchens udviklingsmuligheder.

Hensigten med paneldiskussionen er at perspektivere mine analyser uden at disse er kendt af paneldeltagerne, således at diskussionen ikke farves af mine synspunkter.

Panelet sammensættes af eksperter med forskellig baggrund inden for byggesektoren, således branchens forskellige grene søges dækket: Rådgivere, udførende, byggematerialeproducenter samt forskere med forskellig baggrund inden for byggeriet.

Konsultationen gennemføres efter den klassiske Delphi metode, men med e-mail kommunikation, hvor den enkelte er helt anonym - for at give mulighed for at svare uafhængigt og ærligt. Deltagerne kan hverken se hvem de andre er eller andres svar.

Deltagerne udfylder først et kort spørgeskema, hvis svar jeg bearbejder statistisk og rundsender anonymt og enkeltvist til paneldeltagerne.

Herefter diskuteres udvalgte spørgsmål af betydning for byggebranchens fremtidige udvikling. Jeg giver igen 'statistisk feedback' på diskussionen og processen gentages indtil meningerne ligger relativt konstant.

For at forbedre muligheden for at se på den danske byggebranche 'udefra', har jeg valgt at skrive min afhandling på Robert Gordon University, Aberdeen, Storbritannien. Paneldeltagernes holdninger og svar anonymiseres naturligvis i den endelige afhandling.

Uden forskning ingen udvikling i byggebranchen.. Jeg håber derfor, at du vil afse nogle minutter til at deltage i denne Delphi konsultation og ser frem til et hurtigt og positivt svar.

Med venlig hilsen

Erik Kærgaard Kristensen
Cand. Arch., HD. PgCert (research)

Delphi panel consultation on the development of the Danish building industry

As a final part of my PhD thesis that deals with the Danish Building Industry's Future Development, I plan a Delphi consultation panel, whose purpose is to consult a small panel of experts on the industry's development.

The panel discussion is thus contrasting my study, without the panellists knowing the contents of my thesis on beforehand, to avoid that the discussion is coloured by my views.

The panel will be composed of experts with diverse backgrounds in the building industry to cover its various branches: Consultants, contractors, the building materials industry as well as researchers with a background in management and production in the building industry.

Consultations are conducted as e-mail communication, where the individual panellist is completely anonymous - to provide the opportunity to respond independently and honestly. The participants cannot see the identity of other panellists or their answers.

The participants fill out a short Questionnaire, which I process statistically and circulate anonymously and individually to the panellists.

Thereafter selected issues of importance to the construction industry's future development are discussed. Again, I give 'statistical feedback' on the discussion and the process is repeated until the opinions are relatively constant.

To improve the ability to look at the Danish construction industry from 'outside', I decided to write my dissertation at Robert Gordon University, Aberdeen, UK. The views and responses of panel members are kept anonymous, of course, in the final thesis presentation.

Without research no development in the construction industry... I hope that you will devote a few minutes to participate in this Delphi consultation and look forward to a swift and positive response.

Sincerely,

Erik Kærgaard Kristensen
Cand. Arch., HD. PgCert (research)

Delphi Panel: Future Scenarios of the Danish Building Industry

Svar	Indledende spørgeskema	Preliminary Questionnaire
Replies	**På langt sigt… (mindst en 10 års horisont)**	**In the long term… (at least a 10 year horizon)**
	1. Hvordan **vurderer** du den *nuværende* byggesektors **muligheder** for at *forbedre* problemerne med produktivitet, fejl og mangler og bygherre- og brugertilfredshed? *Tast et svar i venstre felt med et af tallene 1-5, hvor 1 = Meget dårlige og 5 = Meget gode.*	1. How do you **assess** the *present* building sector's **opportunities** to *improve* its problems concerning productivity, defects and client and user satisfaction? *Enter your reply in the left field using one of the numbers 1-5, where 1 = Very bad and 5 = Excellent.*
	2. Vil byggeriet med hensyn til **industrialisering og ledelse** af den gamle byggeproces kunne følge med udviklingen i forhold til andre brancher af tilsvarende størrelse? *Tast et svar med tallene 1-5, hvor 1 = Byggebranchen sakker bagud og 5 = Byggebranchen er forud.*	2. Is the building industry in terms of **industrialisation and management** of the old building process able to keep up with developments in other industries of a similar size? *Reply using the numbers 1-5, where 1 = The building industry falls behind and 5 = The building industry is ahead.*
	3. Forudser du ændringer af de nuværende **faggrænser og sammenlægning** af virksomheder på tværs af faggrænser? *Tast et svar med tallene 1-5, hvor 1= Små ændringer og 5= Store ændringer.*	3. Do you foresee changes to the existing professional **boundaries** and **mergers** of companies involving different disciplines? Enter your reply with the numbers 1-5, where 1 = Small changes and 5 = Big changes.
	4. Hvilken **udviklingsstrategi** bør byggebranchen følge? *Vælg 5 blandt de 10 nedenfor nævnte muligheder og prioriter dem med tallene 1-5, hvor hvert tal kun bruges én gang: 1 = laveste og 5 = højeste prioritet.*	*4.* Which **development strategy** should the building industry follow? *Pick 5 among the 10 below mentioned choices and grade them, using the figures 1-5, where each digit is used only once: 1 = lowest and 5 = highest priority.*
	4.1 Fortsætte uændret, men med gradvis øget brug af præfabrikerede byggeobjekter etc. fra byggematerialeindustrien.	4.1 Continue unchanged, but with an increased use of prefabricated building objects etc. from the building materials industry.
	4.2 Fortsætte uændret, men øge brugen af IT – Revit, BIM, Bygge-web etc.	4.2 Continue unchanged, but increase the use of IT - Revit, BIM, Sharing of drawings etc. on the Web etc.
	4.3 Fortsætte uændret, men forbedre kommunikation og samarbejde (eksempelvis faste samarbejdskonstellationer).	4.3 Continue unchanged, but improve communication and collaboration (e.g. fixed cooperation constellations).
	4.4 Fortsætte helt uændret.	4.4 Continue unchanged.
	4.5 Byggeriet bør lære af og låne fra øvrige industrier (ledelse, produktion etc.).	4.5 The building industry should learn and 'borrow' from other industries (knowledge about production and management, etc.)
	4.6 Opbygge nye *integrerede, industrielle byggevirksomheder*, der selv står for design, produktion og marketing og er i stand	4.6 Establish new *integrated, industrial construction companies* with integrated design, production and marketing that are able to

	til at høste rationaliseringsgevinsten herved og som kan producere til *ukendte kunder*, ligesom andre branchers virksomheder.	harvest the rationalization gains, and who are able to produce for *unknown customers*, like other contemporary companies.
	4.7 Gradvis værdioptimering af produktionen gennem eksempelvis Lean Construction principper 'lånt' fra Toyota.	4.7 Gradual value-optimization of the production through e.g. Lean Construction principles, 'borrowed' from Toyota.
	4.8 Reducere håndværket for at opprioritere industrialiseringen af byggeriet.	4.8 Reduce craftsmanship and increase industrialisation.
	4.9 Satse på, at uddannelsessystemet gradvist vil 'industrialisere' indholdet i uddannelserne og efterfølgende i branchen.	4.9 The educational system will gradually 'industrialize' the content of higher educations and subsequently in the building industry.
	4.10 Andet – I givet fald hvad?	4.10 Or…?
	5. **Hvorfor har byggebranchen ikke gennemløbet samme udvikling som andre brancher?** *Vælg 5 blandt de 7 nedenfor nævnte muligheder og prioriter dem med tallene 1-5, hvor hvert tal kun bruges en gang: 1=laveste prioritet og 5=højeste prioritet.*	*5.* **Why hasn't the building industry progressed like other industries?** *Pick 5 among the 7 below mentioned choices and grade them using the figures 1-5, where each digit is used only once: 1 = lowest priority and 5 = highest priority.*
	5.1 Byggeriet er i en fastlåst situation, som der ikke er noget incitament til at ændre og som forhindrer 'læring'.	5.1 The building industry is 'locked' in a situation with no incentive to change and that prevents 'learning'.
	5.2 Byggeriet er præget af en gammel, konservativ kultur, som branchen ikke selv kan komme ud af.	5.2 The building industry is marked by an old, conservative building culture, which the industry cannot get out of by itself.
	5.3 Det grundlæggende problemkompleks er ikke erkendt – derfor bliver det ikke håndteret og løst.	5.3 The basic problem complex has not been recognized – therefore the problem cannot be handled and solved.
	5.4 Nogle interessenter har ikke fordel af og ønsker derfor ikke forandring.	5.4 Some stakeholders do not benefit from and therefore do not want change.
	5.5 Grundlæggende forandring kræver store investeringer i fast kapital og uddannelse.	5.5 Fundamental transformation requires large investments in fixed capital and education.

Spreadsheet with Answers to the Preliminary Questionnaire

Delphi Panel members:

Answers to the Preliminary Questionnaire

Panellist	Q1	Q2	Q3	Q 4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	**4.10**	5.1	5.2	5.3	5.4	5.5	5.6	5.7
A	4	3	**4**	4	5	3				2		1		3	1	5	2	4		
E	4	3	**3**	5	1	2			4	3				4	2	5	1	3		
C	3	3	**4**		5	2		4	1			3		1	3	2	4	5		
B	4	3	**4**	1	2	3				5		4		5	4	3	2		**1**	
G											0		0							0
D	2	1	1	2	3	**4**	1		5					1		2	3	4	5	
F	3	4	**4**	2				3	1	5		4		3	5	4	1		2	
Sum with 5 panellists	17	13	16	12	16	14	1	4	10	10	0	8	0	14	10	17	12	16	6	0
Sum with 6 panellists	20	17	20	14	16	14	1	7	11	15	0	12	0	17	15	21	13	16	8	0
Median with 5 panellists	4	3	4	3	3	3	1	4	4	3	0	3	0	3	3	3	2	4	3	0
Quartile with 5 panellists	3	3	3	1,75	2	2	1	4	2,5	2,5	0	2	0	1	1,75	2	2	3,75	2	0
Median with 6 panellists	4	3	4	2	3	3	1	4	3	4	0	4	0	3	3	4	2	4	2	0
Quartile with 6 panellists	3	3	3,25	2	2	2	1	3,25	1	2,75	0	2,5	0	1,5	2	2,25	1,25	3,75	1,5	0
Order with 5 panellists				3	1	2	7	6	4	4	8	5	9	3	5	1	4	2	6	
Order with 6 panellists				3	1	3	7	6	5	2	8	4	9	2	4	1	5	3	6	

Appendix C. Definitions

C.1 General Terms

Abduction, or **inference to the best explanation**, is a method of reasoning in which one chooses the hypothesis that would, if true, best explain the relevant evidence. Abductive reasoning starts from a set of accepted facts and infers to their most likely, or best, explanations. The term *abduction* is also sometimes used to just mean the generation of hypotheses to explain observations or conclusions, but the former definition is more common both in philosophy and computing.
Abduction allows inferring *a* as an explanation of *b*. Because of this, abduction allows the precondition *a* of "*a* entails *b*" to be inferred from the consequence *b*. Deduction and abduction thus differ in the direction in which a rule like "*a* entails *b*" is used for inference. As such abduction is formally equivalent to the logical fallacy affirming the consequent. Therefore abductive reasoning is like Post hoc ergo propter hoc as the cause is questionable.

Deduction allows deriving *b* as a consequence of *a*. In other words, deduction is the process of deriving the consequences of what is assumed. Given the truth of the assumptions, a valid deduction guarantees the truth of the conclusion. In Descartes, 'deduction' often meant to infer from the general or universal to the special. However, this is a too narrow conception of deduction, because you can also infer deductively to the validity of universal statements. Logic thinking. (Top down).

Induction allows inferring some *a* from multiple instantiations of *b* when *a* entails *b*. Induction is the process of inferring probable antecedents as a result of observing multiple consequents.
The basic form is induction by simple enumeration, which connects from all up till now observed occurrences of the phenomena of the type S has possessed property P, to that a new or all instances of S-phenomena possesses P. E.g. inferring from the singular statements that every single swan so far observed have been white, to the universal statement that all swans are white.

Such an inference is not logically valid, since you without contradicting yourself may assert the premises and deny the conclusion.
Statistics is a typical example of inductive thinking; to infer the general conclusion from singular data or statements. (Bottom up).

C.2 Production, productivity and derivatives

The term **production** in a contemporary context describes a *process* where one or more production factors fabricate commodities for sale, for instance when raw materials are transformed by a production factor such as man power or machinery into goods.
To *produce* is a Latin term (*pro* ~ forward and *ducere* ~ lead) that means to bring something forward into a new existence. 'To make something from something else'.
The term itself does not account for the type of production, e.g. manual, industrial, service or intellectual or in other words: Craft, mass production and the current era (Brown et al., 2005).
The production, Y, could be expressed as a function, F, and the context would be: $Y=F(A,K,L,X)=A*F(K,L,X)$, where K is the total real capital, L is the total labour, X is the total consumption in the production, and A is a parameter for efficiency also named the 'total factor productivity'.

A **production factor** refers to raw materials, manpower, capital (IT such as hard & soft ware, machines, and buildings) or land.

Industrial production: *Industrial* derives from Latin (*industria* ~ enterprise, from indu- (*endo-* within), and *struere* ~to build). Strictly speaking it means that something is produced in an entrepreneurial way, but what is 'industrial' in one époque, is not necessarily industrial (entrepreneurial) in another. It is a term that relates to time. Today it is usually a business term related to *factory operation*.
The distinction between industrial and craft production is vague, but today **industrial production** is perceived as part of a manufacturing process, where manual work is substituted by still more technologically advanced machinery and automation, and characterized by extensive division of labour, and in many cases mass production - controlled by 'management'.

Unlike in Danish, the English term "**industry",** not only refers to the industrialised mode of production, but also relates to activities and people, involved in a particular line of business, regardless of its attached mode of production. In English the term "industry" includes both craft based and industrial production.

Production mode describes a special *composition* of production factors:

Production mode	Land	Capital	Manpower
Feudalism - agriculture Craft (~1850)	Land is the **Predominant** production factor.	Buildings and devices in connection to agriculture	Manual work. Production on site. Commission of work as the standard procurement system.
Industry. Mass production (1850 - 1982)		Capital is the **dominant** production factor. Automation of production processes.	Manual work is gradually replaced by capital investments in factories, e.g. the assembly line. Education becomes needed to operate and service the capital investments. Gradually leadership and management become crucial.
Knowledge & IT Present stage (1982~) Mass customization. Adaptation to customer needs of smaller segments using stratification techniques		Capital is the dominant factor in the production of goods. E.g. robots and computers. Increased investments in service and intellectual production.	**Dominant** in knowledge production. High education, collaboration and the sharing of knowledge is needed to compete in the global market.

The term **productivity** is used, either as the *relation* between the produced quantity of the item measured and the consumed resources in the process, or as the consumed resources per produced unit (The guideline from the Danish ministry of finance (www.oav.dk) used when returning statistical forms to the statistical bureau).

When the productivity increases, it is possible to produce the same amount with less man power, machinery or raw materials. The development in productivity is therefore a decisive factor for the prosperity of the population, whether the wealth takes the form of higher real wages or more time off.

When **measuring productivity** and the effect of different productivity factors statistically, the focus is on **the quality of the labour force** (the level of education), and here the measurements of the education of the labour force is subdivided in 5 levels of education: 1) Basic school (9 years), 2) vocational education, 3) 2 years further education (technician level), 4) 3-4 years medium higher education (bachelor level), 5) 5 years higher education (master level). Most education is free for the student, paid by the tax payers. In the building industry the constructing architects (bachelor level) e.g. have had intensive training in using CAD systems since the mid 90s on the basis of one PC per 1-2 students.

Capital investments subdivided into 1) traditional standard machinery plus buildings and 2) IT related software & hard ware, according to standard OECD definitions.

The 'Total Factor Productivity', TFP, is defined as an index for production divided by an index for the total factor performance. In practice it means all causes, affecting productivity, except labour and capital. This factor should in general be understood as 'leadership and management and general technological progress in society'. They are in the same category because it normally takes leadership and management to utilize technological progress.

In the case of one sector lacking behind the others the exchange rate between commodities from different sectors becomes crucial: While a building worker for example today is able to buy a colour TV for only a small fraction of the work hours, he had to spend in 1970, a metal industry worker has to work many more hours today to pay the carpenter or painter for maintenance work – if he does not do it himself, which is more likely, because he cannot afford to pay the low productivity building worker.

Appendix D. DISCOURSE AND PRACTICE

What we know as 'fact', what can be proven to be true rather than believed to be true, is not a constant phenomenon. What we think we know as fact varies from episteme to episteme. Therefore persons, who belong to different traditions that again represent different episteme might have problems understanding each other. The classic example is probably 'primitive' people meeting 'the white man' for the first time, but another more relevant example could be *architects and engineers*, whose professional foundation originate from different episteme and are attached to different modes of production. Architects to a pre-industrial art tradition and the craft production mode on the one hand and engineers on the other hand to a natural science based tradition and the industrial production mode.

Since the industrial breakthrough, it has been evident that architects and engineers speak 'different languages'. But today there is a dawning recognition among some architects that considerations about energy consumption and economy in construction become increasingly important and this understanding might progressively expose the limitation of the old art and craft-based world, which most architects are brought up in, according to (Larsen 2010). Architect Vibeke Grube Larsen continues in the magazine of the organization of Danish Architect Firms:

> "There is a cultural barrier between architects and engineers in the way they work" ... "The architect, who sits on a pedestal and heads the battle from an aesthetic point of view, is a dying breed." … "There is a paradigm shift under way, no doubt about it." (Author's translation).

1. Discourse analysis – methodology

This study compares some elements of discourse and its associated practice in regard to the mode of Production, Leadership and Business Culture across the pre-industrial and industrial episteme, found in the industrialised industries and the Building Industry.

We observe the world through sensory organs, which feed the brain with information (Scoonover 2010), but the real problem for the brain or human mind, has never been to obtain information / empirical data, but to sort /

classify and interpret these data (Nørretranders 1991). In this process the emergence of language seemingly plays an important role.

People without language also benefit from mental activity and thinking, but it is likely they are limited by the difficulty to structure and organize thoughts without language. It is difficult to collect and classify experiences without linguistic *concepts* and furthermore you would have to contain all knowledge in your own memory. It seems liable that man's evolution is connected to the progression of man's linguistic capabilities.

The emergence of the written language only a few thousand years ago, together with the evolutionary phonetic Greek alphabet, probably expanded man's usable memory and the transfer of knowledge from generation to generation. This led to the appearance of a new paradigm, where the accumulation of knowledge could be increased (Greek antiquity with the foundation of what we regard as science), (Mørch 2009), which again led to new opportunities to improve production, leadership etc.

2. Michel Foucault

Foucault, who today is one of the most quoted philosophers in human and social science (Google Scholar), has a special approach to language. He relates 'le discourse' to his historical analysis, archaeology and genealogy of knowledge, which are the distinguishing characteristics of his 'discourse analyses', that he used to demonstrate the displacements in history, and to uncover the power relations, he found was represented in every discourse. History, according to Foucault in *The Order of Things: an Archaeology of the Human Sciences*, is characterized by fractures and coincidences rather than consistency and straight development, as concluded by Raffnsøe, Gudmand-Høyer and Thaning (2009 p. 157). This applies to a society, a line of business or a profession.

As shown in part I of this thesis, the various Danish industries have not all progressed at the same speed and in the same direction. The building industry is lagging behind the others, indicating a symptom of a 'displacement in history' in regard to industrialisation, leadership, business culture etc. which for a long time has needed to be investigated further.

Because Foucault proved **the detailed historical analysis -** which seeks to describe the evolution of man's thinking, various professions, etc. - to be useful in a context similar to this, it seems expedient to try to make use of his thinking.

3. Language and a qualitative methodology approach

In the 20th century philosophy, outside the natural sciences, a new focus on the importance of language and the structural and **linguistic turn** emerged.

> Raffnsøe, Gudmand-Høyer and Thaning (2009. p 164), state that it has become customary to speak of a so-called linguistic turn,[21] which covers many different philosophical directions, all focusing on language as both carrying and producing reality.
> Instead of being a medium that transparently represents reality, language is perceived as the *precondition for reflection*, which it is impossible to get behind. *Knowledge is linguistically structured and therefore a perception of reality outside language is rejected.*
> In retrospective, Foucault's work from 1966, *The Order of Things: an Archaeology of the Human Sciences / Les mots et les choses,* can be seen as an examination of the background for, the implications and challenges of the linguistic turn. (Author's translation).

Before the *linguistic turn*, we had on the one hand *'reality'* and on the other *'language'* and nobody doubted to look first in the tangible, sensory reality as it can be experienced (through the representations, available to it, such as empirical, quantitative data etc.) prior to the language, which was seen more as a presentation tool for the sensuous experiences.

But after the linguistic turn, things have arguably been turned upside down. When the structure of the language is mirrored in the human activities and forms them, it seems natural to start by examining the language and how it has structured and developed the sensuous reality.

In this way language itself becomes the target of scrutinizing how man's activities are organized; and because the structures of the language are mirrored in man's activities, *language becomes a principal source to understand reality.*

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[21] The expression is first introduced by Rortys R. in 'The Linguistic turn', 1967. Also Ludwig Wittgenstein, M. Heidegger and from the 'Frankfurt School' Theodor W. Adorno and Jürgen Habermas have focused on the language as an epistemological source.

According to Raffnsøe, Gudmand-Høyer and Thaning (2009 p. 164) language is about to become the central empirical object:

> "Thereby the language ceases to simply appear as a presentation medium, with the function to communicate and to express other more fundamental structures." (Author's translation).

Thus, to examine the language and the discourse is increasingly employed as a research method in its own right, both in a historical and contemporary context.

An episteme is a product of the principles (the conceptual formations) that orders our thinking and decides how we think, and of what.
A particular episteme allows certain things to be thought and said and hence also explains why other forms of knowledge at another time were not possible, since some contexts and necessities were hard to grasp for the field of knowledge of the period and therefore non-existent in mans consciousness.

In part II, I have compared the use and associated practice of key concepts, selected according to their role in the building industry environment and on the bases of their relevance for the practice in the building industry.

The use of these concepts is compared across two time spans: Elements of discourses from *both* the *pre-industrial episteme* that represents reminiscences of the mode of production, leadership and business culture from the antique and medieval society, *and* elements from the *industrial episteme*, representing our contemporary world with its mode of production, leadership and business culture:

> **The pre industrial episteme[22]:** Production, leadership and business reminiscences from the antique, medieval and craft based historical periods.
> **The industrial episteme:** Production, leadership and business elements from our contemporary industrialised and post-industrial periods.

[22] 'Episteme' is used nearly like paradigm, meaning the predominant knowledge in a given historical period.

4 Using Foucault's work

As Rapley (2007 p. 133 puts it:

> "People studying discourse are interested in how language is used in certain contexts. The focus is on how specific identities, practices, knowledge or meanings are produced by describing something in just that way over another way. Our understanding of things, concepts or ideas that we might take for granted are not somehow natural or pre-given but are rather the product of human actions and interactions, human history, society and culture".

In this context, it is essential to recognize that - in regard to discourse analysis, Foucault **never made a formal methodology**. He believed the methodology had to be adapted to every specific task. Raffnsøe, Gudmand-Høyer and Thaning (2009 p. 158) find:

> "Language and discourse in Foucault never form a foundation to serve as impetus for a general discourse theory". Instead, Foucault sought to clarify which discourse concept he basically used in the historical studies, and thus bear in mind the particular historical impetus for his analyses. It is therefore **mistaken, from Foucault to produce a theory of discourse** in a direct and systematic manner" (Author's translation).

While linguists have developed formal discourse analysis methodologies for their special purposes, it is not the linguistic analysis that Foucault cared about, when he wrote about 'discourse analyses', but rather a historic investigation with the purpose to reveal new aspects of understanding, concerning the world we live in at present.

What is understood by 'discourse analysis'?

According to Foucault (1970) in *The order of Things*, it is any time period's perceptions of, how the order of things seems to be, which form the basis of what kind of knowledge that is possible. In every era there is a common structure within which knowledge is shaped. This knowledge is therefore not readily available in other ages because of their different ways of thinking. The different ways of organizing the world in various eras must be understood in relation to what is contrary to order – e.g. the period's examples of absence of order: Madness, Heresy etc. which threatens the accepted limits that are created by the thinking of the time. The things that are 'threatening and dangerous' and the associated 'angst' must be understood as a force behind the creation of order.

The **discourse analysis** is thus about finding the rules for which *statements, concepts and objects* are being accepted as meaningful and true - or the opposite - in a given historical period.

Archaeology

Language reveals the history of man when subjected to a historical analysis, because it is not only 'les choses' that is the object of archaeology – also 'les mots' have a history to tell. Because the structure of the language also is to be found in man's activities, it is possible to analyse e.g. the building industry by looking at 'les mots' – the concepts used across two episteme, with the purpose to reveal something about the present state of the building industry (e.g. that it is still pre-industrial and beyond reach of industrial management etc.).

5 Concepts as basic classification tools

A tool for the creation of order is how we classify things and according to Olsen (1982), it is the **special function of concepts** that they must be understood as **classification tools**. Concepts are important to man, because they are used to classify all the things in our environment. It seems reasonable to assume that concepts and classifications, which have 'survived' for a long time, are correspondingly precise, useful and tell important history about the context, they are part of.

But every order is incomplete and subject to erosive forces and therefore the ways things are classified varies according to what makes sense at a certain time and in relation to different discursive spaces (e.g. the building industry) and specific practices: E.g. the mode of production, leadership style, buyer perception etc. in the building industry.

I therefore need to place the concepts and their associated practices in both time and space. A concept, fixed in both space and time, I call a **'conceptual formation'**, which thus has two dimensions; it exists in a conceptual space and a conceptual time frame.

Concepts in general are created as a *reflection of the social practice they belong to*, so it becomes possible to think, talk about, and describe the practical

reality. The most useful concepts are those that most accurately describe that relation to practice and therefore survive longest.

The origin of this communication (discourse) can be related to a specific historical period and so can the corresponding social practice.

6. The discourse analysis and my choices

Since my purpose is not to analyse a certain text, I focus on the concepts, as the basic element of Foucault's *'discourse formation' (regularities between objects, statements, and **concepts**)* - in a way that serves my purpose and in harmony with Foucault's work: Namely a historical analysis of the use of basic **conceptual formations** in the construction industry environment.
This means that there will be less focus on statements and objects and more focus on the selected concepts and the way they classify the environment.
The selected concepts are *basic, systemic concepts*, which the building industry and all architect firms must relate to, in order to cope with their profession.
These concepts are compared with the similar basic notions, which are used in the industrialised world and are placed in time in the historical framework, where they belong.

From *Archaeology of Knowledge,* is known that the formal knowledge fields such as **sciences** (medicine, economics, etc.) also **include the practices that surround them** and that there can be **no knowledge without a particular discursive practice**.
(In relation to the different episteme, the sciences also cover different contents – thus the sciences do not cover a specific fixed subset of reality).

> **From this follows that any discourse is part of and surrounded by a social practice. The two are interrelated: If the discourse is pre-industrial, so is the social practice – and vice versa!**

This constitutes the guiding principles (or methodology) for the analysis in part II of this thesis.
For many of us, the old culture in the building industry and its leadership is only comprehensible, if we explain it on the basis of today's situation in the industrialised industries and try to understand 'backwards' from there.

For that reason, we will primarily focus on how the concepts are regarded in the industrialised industries, compared to the similar proceedings and concepts in the building industry.
First, the discursive, conceptual formations in modern industries are compared to those of the building industry. Next, the corresponding social practices are compared.
Finally the origin of the discourse and its practice are dated historically and to the corresponding episteme.

7. Systemic, key, conceptual formations

The concepts that are subject to the discursive analysis in part II have been selected, because of their role in the building process as classification tools. They are distinctive systemic concepts used in the building industry environment, and cover the various aspects of the building process from design, procurement to production and the leadership of building projects, as well as the perception and role of the buyers. The selected discursive concepts and their associated practices are:

'Buyer perception': How the 'buyer' is regarded, what his role and obligations are. Is he a **customer in the industrial episteme**, whose only obligation is to pay the agreed price or is he a **client in the pre-industrial episteme** with leadership obligations? See chapter 6.

'Business enterprise':
In the **industrial** context, one producer with one leadership implements one unified production process and operates independently on the market to satisfy customer needs, using the available industrial management tools. The **industrial business enterprise, $BE_{(ind)}$** can be seen as the organisational framework, with its own primary leadership and management function around internal functions like production, economy, communication and personnel. See chapter 7.
In the **pre-industrial** context and particularly in the building industry, production traditionally is organised as single assignments, around the client, his needs and leadership with shifting groups of participants. (Several actors implement a divided process). Therefore the contemporary conception of a

business enterprise is seldom found, or at least not until the emergence of e.g. D&B contractors; who even often continue the old building process and e.g. organize the production using several subcontractors, who vary from project to project. The **pre-industrial business enterprise, $BE_{(pre\text{-}ind)}$** in the building industry can be seen as the separate organisational framework of the participating groups of professionals, craftsmen, workers etc., who with their own partial leadership function, each take on an assignment or fulfil a contract in a singly building project in return for payment.

'Leadership and management': In the industrial context, it is the primary leadership and management of the business enterprises' industrial daily routine operations, to which project management is a supplement. See chapter 8.
In the pre-industrial context in the building industry, we do not find a direct parallel to industrial Leadership and management in the absence of corresponding business enterprises. What we have, is the leadership style of the old building culture, centred on the client and his project.
This old Building Process Leadership, **BPL** is characterised by the client being the principal, who assembles the necessary groups of workers and resources to implement his project and who is the overall leader of 'everything'. The old model was later modernised and systematised in the direction of 'project management', **$PM_{(pre\text{-}ind)}$** and the 'Phase Model'.

'Procurement model': Describes the process according to which a building is acquired – such as who has the initiative and controls the process.
The Seller Driven Marketing Model, SDMM, used in the industrial episteme.
The Buyer Driven Procurement Model, PDPM, used in the pre-industrial episteme. See chapter 5.

'Project'. *Temporary, professional activities that are singular business assignments, which require their own organizational framework*, which in the context of an **industrial mode of production** is different from and a supplement to the normal daily routine operations. Here the project solves the single tasks that do not fit with the industrial routine production. In short $P_{(ind)}$.
In the context of a **pre-industrial mode of production**, a project is perceived as *temporary, professional activities that are singular business assignments that require their own organizational framework* – albeit here the project is not

a supplement to any parallel daily routine operation. Projects *are* the daily routine operation. In short $P_{(pre\text{-}ind)}$.
In the building industry $P_{(pre\text{-}ind)}$ is simply a standalone assignment, organized around the Client, his needs and leadership. See chapter 7

'Project management': ~ the approaches to planning, executing and controlling a project, using analytic, deductive methods. The old *building project* leadership model was copied and transformed by industrialised industries after the Second World War to an *'industrial' project management model,* while the building industry still has its own leadership model. In this way we have two types of project management: See chapter 8.
Project management, $PM_{(pre\text{-}ind)}$. The pre-industrial leadership activities designed for leading projects, $P_{(pre\text{-}ind).}$ This is the original 'project management', which we still find in the building industry and today often refer to as the Phase Model.
Project management, $PM_{(ind)}$. The industrial leadership activities designed for managing projects, $P_{(ind)}$. This is the project management in the industrialised industries, which today is the standard outside the building industry.

Appendix E. DATA EXAMPLE

Example of raw data collected from 'Statistikbanken.dk' for figure 7

Attainment of the population by industry, and highest education completed

Data for FIGURE 7

	EMPLOYEES	HIGHEST EDUCATION	2008	% of industry total
All Denmark	TOT Industry, total	10 BASIC SCHOOL 8-10 grade	1200408	30,94
		20 GENERAL UPPER SECONDARY SCHOOL	232086	5,98
		25 VOCATIONAL UPPER SECONDARY SCHOOL	89367	2,30
		35 VOCATIONAL EDUCATION	1253715	32,32
		40 SHORT-CYCLE HIGHER EDUCATION	183799	4,74
		50 MEDIUM-CYCLE HIGHER EDUCATION	476736	12,29
		60 BACHELOR	60263	1,55
		65 LONG-CYCLE HIGHER EDUCATION	232518	5,99
		70 PhD-DEGREE	13765	0,35
		90 UNKNOWN	136654	3,52
		Total	3879311	100,00
	CF Pharmaceuticals	10 BASIC SCHOOL 8-10 grade	1737	10,26
		20 GENERAL UPPER SECONDARY SCHOOL	673	3,97
		25 VOCATIONAL UPPER SECONDARY SCHOOL	253	1,49
		35 VOCATIONAL EDUCATION	4027	23,78
		40 SHORT-CYCLE HIGHER EDUCATION	3218	19,00
		50 MEDIUM-CYCLE HIGHER EDUCATION	1824	10,77
		60 BACHELOR	372	2,20
		65 LONG-CYCLE HIGHER EDUCATION	3727	22,01
		70 PhD-DEGREE	835	4,93
		90 UNKNOWN	268	1,58
		Total	16934	100,00
	CH Basic metals and fabricated metal products	10 BASIC SCHOOL 8-10 grade	15485	32,07
		20 GENERAL UPPER SECONDARY SCHOOL	1069	2,21
		25 VOCATIONAL UPPER SECONDARY SCHOOL	767	1,59
		35 VOCATIONAL EDUCATION	24127	49,97
		40 SHORT-CYCLE HIGHER EDUCATION	2535	5,25
		50 MEDIUM-CYCLE HIGHER EDUCATION	2180	4,52
		60 BACHELOR	223	0,46
		65 LONG-CYCLE HIGHER EDUCATION	597	1,24
		70 PhD-DEGREE	21	0,04
		90 UNKNOWN	1277	2,64
		Total	48281	100,00
	CI Manufacture of electronic components	10 BASIC SCHOOL 8-10 grade	5425	25,16
		20 GENERAL UPPER SECONDARY SCHOOL	856	3,97
		25 VOCATIONAL UPPER SECONDARY SCHOOL	524	2,43
		35 VOCATIONAL EDUCATION	6895	31,98
		40 SHORT-CYCLE HIGHER EDUCATION	2064	9,57
		50 MEDIUM-CYCLE HIGHER EDUCATION	2904	13,47
		60 BACHELOR	289	1,34
		65 LONG-CYCLE HIGHER EDUCATION	1963	9,10
		70 PhD-DEGREE	212	0,98
		90 UNKNOWN	431	2,00
		Total	21563	100,00
	CK Manufacture of machinery	10 BASIC SCHOOL 8-10 grade	15518	23,90
		20 GENERAL UPPER SECONDARY SCHOOL	1318	2,03
		25 VOCATIONAL UPPER SECONDARY SCHOOL	1246	1,92
		35 VOCATIONAL EDUCATION	31099	47,89
		40 SHORT-CYCLE HIGHER EDUCATION	5041	7,76
		50 MEDIUM-CYCLE HIGHER EDUCATION	6151	9,47
		60 BACHELOR	691	1,06
		65 LONG-CYCLE HIGHER EDUCATION	2443	3,76
		70 PhD-DEGREE	150	0,23
		90 UNKNOWN	1279	1,97
		Total	64936	100,00
	F Construction	10 BASIC SCHOOL 8-10 grade	55185	28,75
		20 GENERAL UPPER SECONDARY SCHOOL	3225	1,68
		25 VOCATIONAL UPPER SECONDARY SCHOOL	2363	1,23
		35 VOCATIONAL EDUCATION	107823	56,18
		40 SHORT-CYCLE HIGHER EDUCATION	10141	5,28
		50 MEDIUM-CYCLE HIGHER EDUCATION	7742	4,03
		60 BACHELOR	420	0,22
		65 LONG-CYCLE HIGHER EDUCATION	1420	0,74
		70 PhD-DEGREE	18	0,01
		90 UNKNOWN	3595	1,87
		Total	191932	100,00

Source: Danmarks Statistik, Statistikbanken. KRHFU2. 2011

See www.dst.dk/Kommunalreform for definition of ~~regions~~. The population between age 15 and 69 is estimated the 1 st. of january the year concerned. The highest education is estimated the 1 st. of october the year before.

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